UNITED STATES OF AMERICA:
WAR DEPARTMENT.

MONTHLY WEATHER REVIEW.

(GENERAL WEATHER SERVICE OF THE UNITED STATES.)

AUGUST, 1887.

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PUBLISHED BY AUTHORITY OF THE SECRETARY OF WAR.

WASHINGTON CITY:
SIGNAL OFFICE.
1887.

no 2

List of merchant marine steam and sailing vessels from which International Simultaneous Meteorological reports were received at the Office of the Chief Signal Officer, U. S. Army, Washington, D. C., in time to be used in the preparation of the Weather Review for the month of August, 1887.

	Name of vessel.	Captain.
	Allan Line.	
Br.	s. s. Buenos Ayrean	Capt. J. Scott.
	Grecian	C. E. Le Gallias.
	Hibernian	J. Brown.
	Manitoban	Wm. Dunlap.
	Prussian	J. Ambury.
	Sarmatian	W. Richardson.
	Scandinavian	John Park.
	American Line.	
Br.	s. s. British King	John Kelly.
	British Prince	S. Nowell.
	British Princess	E. H. Freeth.
Am.	Indiana	W. J. Boggs.
Br.	Lord Clive	P. Urquhart.
	Lord Gough	E. M. Hughes.
	Anchor Line.	
Br.	s. s. Alsatia	J. Brown.
	Anchoria	W. Brown.
	Circassia	A. Campbell.
	City of Rome	H. Young.
	Columbia	Thos. Mitchell.
	Devonia	W. G. Crockhart.
	Dorian	J. McKeague.
	Ethiopia	John Wilson.
	Furnessia	J. Hedderwick.
	Olympia	L. Swain.
	Arrow Line.	
Br.	s. s. Critic	Esen Davis.
	Monte Rosa	C. Thomas.
	Atlas Line.	
Br.	s. s. Alba	J. W. Sanson.
	Alvena	F. McKay.
	Alvo	D. Williams.
	Andes	T. M. MacKnight.
	Athos	H. Low.
	Booth's S. S. Co. (limited).	
Br.	s. s. Basil	H. Thompson.
	Clement	T. Burley.
	Cyril	J. H. Johnson.
	Jerome	Benj. Crimp.
	Bordeaux Steam Navigation Co.	
Fr.	s. s. Chateau Yquem	C. F. Journeil.
	Bristol-City Line.	
Br.	s. s. Brooklyn City	W. Fitt.
	Jersey City	E. Horlor.
	Llandaff City	T. H. Gore.
	Canada Shipping Company.	
Br.	s. s. Lake Nepigon	P. D. Murray.
	Lake Winnipeg	H. Campbell.
	Cromwell Line.	
Am.	s. s. Louisiana	E. V. Gager.
	New Orleans	T. P. C. Halsey.
	Clyde Line.	
Am.	s. s. Yemassee	1st Off. J. C. Norton.
	Cunard Line.	
Br.	s. s. Aurania	Capt. W. H. P. Hains.
	Bothnia	T. Dutton.
	Catalonia	Edward Wylie.
	Cephalonia	Henry Walker.
	Etruria	T. Cook.
	Pavonia	A. McKay.
	Scythia	T. Roberts.
	Servia	H. McKay.
	Umbria	W. McMickan.
	Fabre Line.	
Fr.	s. s. Neustria	P. Verries.
	Furness Line.	
Br.	s. s. British Crown	A Smith.
	British Queen	R. Wills.
	Stockholm City	K. Doyle.
	General Trans-Atlantic Steamship Co.	
Fr.	s. s. La Bretagne	M. de'Jousselin.
	La Champagne	E. Traub
	La Gascogne	Santelli.
	La Normandie	G. de Kersabiec.
	Great Western S. S. Line.	
Br.	s. s. Dorset	Ch. Off. E. Crossman.
	Oxford	Capt. W. Janes.
	Warwick	L. Morice.
	Worcester	W. Stamper.
	Guion Line.	
Br.	s. s. Alaska	Geo. S. Murray.
	Arizona	S. Brooks.
	Nevada	J. Douglas.
	Wisconsin	E. Bentley.
	Wyoming	C. L. Rigby.
	Hamburg-American Line.	
Ger.	s. s. Bohemia	R. Karlowa.
	Gellert	W. Kuhlewein.
	Gothia	H. Bauer.
	Hammonia	C. Hebich
	Lessing	H. Barends.
	Moravia	O. Pezoldt.
	Rhaetia	H. Vogelgesang.
	Rugia	C. Korbell.
	Suevia	C. Ludwig.
	Wieland	A. Albers.
	Harrison Line.	
Br.	s. s. Counsellor	Wm. Lang.
	Inman Line.	
Br.	s. s. City of Chester	A. Lewis.
	City of Chicago	Fred Watkins.
	City of Richmond	A. Redford.
Am.	s. s. Ohio	R. W. Sargent.
	Johnston Line.	
Br.	s. s. Baltimore	J. Trenery.
	Nessmore	Geo. Elliott.
	Lamport & Holt's Steamship Company.	
Br.	s. s. Herschal	G. Braithwait.

	Name of vessel.	Captain.
	Leyland Line.	
Br.	s. s. Bavarian	Capt. Robt. Leask.
	Bulgarian	E. Parry.
	Virginian	M. Fitt.
	Mallory Line.	
Am.	s. s. City of San Antonia	J. Wilder.
	Carondelet	W. F. Evans.
	Colorado	J. Daniel.
	Lampasas	M. B Crowell.
	Nueces	J. Bolger.
	State of Texas	Gilbert Williams.
	Mediterranean and New York S. S. Co.	
Br.	s. s. Pontiac	H. W. Brown.
	Miss. & Dominion S. S. Co.	
Br.	s. s. Sarnia	Jos. Gibson.
	Morgan Line.	
Am.	s. s. Eureka	R. B. Quick.
	National Line.	
Br.	s. s. Canada	J. Robinson.
	Denmark	R. S. Rigby.
	Egypt	J. Sumner.
	England	A. F. Heeley.
	Erin	Thos. Foot.
	France	A. D. Hadley.
	Greece	A. J. Jeffrey.
	Helvetia	G. Cochrane.
	Holland	Wm. Tyson.
	Italy	Wm. Pearce.
	Spain	W. A. Griffiths.
	The Queen	T. P. Heely.
	Navigazione Generale Italiana.	
It.	s. s. Gottardo	Domenico Viola.
	Letimbro	3d Off. Fr. Diliberto.
	New York and Cuba Mail S. S. Co.	
Am.	s. s. Cienfuegos	Capt. F. M. Faircloth.
	N. Y., Havana & Mexican Mail S. S. Co.	
Am.	s. s. City of Alexandria	J. W. Reynolds.
	City of Washington	W. M. Rittig.
	North German Lloyd Steamship Co.	
Ger.	s. s. Aller	H. Christoffers.
	America	H. Hineke.
	Eider	P. H. Berdrow.
	Elbe	G. Meyer.
	Ems	Th. Jungst.
	Fulda	R. Ringk.
	Main	H. Boedeker.
	Rhein	W. Topser.
	Saale	H. Richter.
	Trave	W. Willigerod.
	Werra	R. Bussius.
	Old Dominion Steamship Company.	
Am.	s. s. Manhattan	Frank Stevens.
	Oregon Railway and Navigation Co.	
Am.	s. s. Columbia	Fred Bolles.
	Oregon	E. Polemann.
	Pacific Mail Steamship Company.	
Am.	s. s. Acapulco	J. M. Caverly.
	City of New York	R. R Searle
	City of Para	L. Dexter
	Colon	J. Henderson
	Granada	J. L. Lockwood.
	Newport	W. G. Shackford.
	San José	D. S. Austin.
	Quebec Steamship Company.	
Br.	s. s. Muriel	G. S. Locke.
	Red "D" Line.	
Am.	s. s. Philadelphia	Sam. Hess.
	Red Star Line.	
Belg.	s. s. Belgenland	W. A. Beynon.
Am.	s. s. Illinois	G. H. Dodge.
Belg.	Nederland	A. J. Griffin.
	Noordland	H. E. Nickels.
	Pennland	Rud. Weyer.
	Rhynland	J. C. Jamison.
	Switzerland	J. Ueberweg.
	Vaderland	C. H. Grant.
	Waesland	H. Buschmann.
	Westernland	Com. W. G. Randle.
	Rotterdam Line.	
Dtch.	s. s. Edam	Capt. J. H. Taat
	P. Caland	F. H. Bonjer.
	Leerdam	G. Stenger.
	Schiedam	A. Potjer.
	Zaandam	H. v. d. Zee.
	Rotterdam	G J. Vis.
	W. A. Scholten	G. Bakker.
	Royal Mail Steamship Co.	
Am.	s. s. City of Dallas	C. W. Read.
	State Line.	
Br.	s. s. State of Georgia	G. Moodie.
	State of Indiana	A. Ritchie.
	State of Nebraska	A. G. Braes.
	State of Nevada	J. A. Stewart.
	Thingvalla Line.	
Dan.	s. s. Geiser	C. W. Möller.
	Hekla	A. G. Thomsen.
	Island	W. Skjodt.
	Twin Screw Line.	
Br.	s. s. Richmond Hill	A. Hyde.
	Tower Hill	F. Archer, R. N. R
	Ludgate Hill	2d Off. H. Dumaresq.
	Union Line.	
Ger.	s. s. Amalfi	Capt. Julius Bahr.
	Australia	G. Franck.
	California	O. Winkler.
	Marsala	N. Maass.
	Polaria	Johannes Schade.
	Polynesia	A. Kuhn.
	Taormina	G. W. Koch.
	United States and Brazil Mail S. S. Co.	
Am.	s. s. Advance	James Lord.

	Name of vessel.	Captain.
	Warren Line.	
Br.	s. s. Iowa	Capt. E. W. Owens.
	Kansas	W. Gleig.
	Norseman	D. Morris.
	White Cross Line.	
Belg.	s. s. DeRuyter	J. J. Bratens.
	Pieter de Coninck	E. Smit.
	White Star Line.	
Br.	s. s. Adriatic	I. G. Cameron.
	Arabic	G. Burton.
	Britannic	H. Parsell.
	Celtic	P. J. Irving.
	Germanic	Benj. Gleadell.
	Wilson Line.	
Br.	s. s. Bassano	W Rea.
	Buffalo	J. H. Malet.
	Galileo	R. T. Jones.
	Marengo	W. Abbott.
	Otranto	W. Rippeth.
	Rialto	F Kerr.
	Salerno	B. H. Rogers.
	Santiago	R. Potter.
	Sorrento	F. W. Ouston.
	Miscellaneous.	
Br.	s. s. Amoor	H. Gasson.
Br.	Aguan	J. Adair.
	Ben Ledi	S. Adamson.
	Bessarabia	2d Off. A. Thomson.
	Cervin	Capt. S. Hughson
	Chilian	E. F. Bannister.
	Dours	R. S. Branfoot.
	Durham City	D. D. Galbraith.
	Earnmoor	R. J. Grey.
	Edith Godden	J. H. Bennett.
Span.	Eleano	V. de Ispizua.
Br.	Elstow	T. Robertson.
Span.	Fitzroy	Henry Gibb.
	Hugo	A. de Mugica.
Br	Kings Cross	G. J. Mills.
Am.	Light-ship No. 37	Andrew Jackson.
Br.	Ocean Prince	W. J. Milburn.
	Peconic	G. Evans.
	Pawnee	John James.
	Pomona	J. Legoe.
	Queen	J. Annison.
	Roseville	J. Dove.
	Saint Romans	Henry Campbell.
Span.	Serra	F. de Luzarraga.
Br.	Surrey	R Griffiths.
	Vertumnus	C. E. Cook.
	Viola	L. Murray.
	Westbourne	Ch. Off. W. Shaw.
	Wylo	Capt. T. L. Rogers.
	New York Herald Weather Service.	
Br.	s. s. Alene	E. J. Seiders.
Am.	Algiers	J. B. Percy.
Ger.	Aller	H. Christoffers.
Br.	Arizona	Sam Brooks.
	Barracouta	Robert Hubbard.
	British Queen	R. Wills.
Am.	Caracas	N. M. Hopkins.
Fr.	Chateau Lafite	C. Ollivier.
	Chateau Marquax	A. Sensine.
Br.	City of Berlin	F. S. Land.
	City of Montreal	R. Leitch.
	City of Puebla	John Deaken.
Am.	El Monte	J. W. Hawthorn.
	El Paso	H. S. Quick.
	Knickerbocker	F. Remble.
Ger.	Prinz Frederich Carl	F. H. Storm.
	Sailing vessels.	
Br.	bk. Abyssinian	John Hughes.
Am	Alice	W. G. Kair.
Nor.	Artemis	E. E. Moe.
Am.	bg. Abbie Clifford	D. W. Storer.
	bk. Ada P. Gould	W. B. Henrahan.
Nor.	sp. B. B. Metcalf	E. P. Larsen.
Am.	bgt. Bonny Doon	C. Burgess.
	schr. C. H. Foster	W. V. Bernard.
Br	bk. C. S. Parnell	Ch. Off. John Crozier.
	sp. Chas. S. Whitney	Capt. Geo. D. Spicer.
	schr. Comet	W. A. Aldrich.
Am.	sp. E. B. Sutton	C. O. Carter.
	schr. Edward R. Emerson	A. H. Child.
	bk. Essex	G. W Hall.
	bk. Florence	Mate A. P. Goodman.
Nor.	bk. Grundloven	Capt. O. G. Ellingsen.
	Hanna	S. Falch Muns.
Dtch.	bk. Helena	T. T. Verbeet.
Nor.	bk. Hermon	O. Olsen.
Br.	Iodine	Adam Smith.
Am.	bkt. Josephine	Chas. Brown.
Br.	bk. Jose E. More	A. Lenhard.
Ger.	sp. J. W. Gildemeister	A. Lehmann.
Ger.	bk. Kepler	G. Atken.
Nor.	sp. Komandor Svend Foyn	J. Bryde.
Am.	bg. L. F. Munson	J. V. McKowen.
Ger	bk. Leocadia	John Stohff.
Am.	bg. Lilian	H. T. Schive.
Br.	bk. Mary	Chas. Acocks.
Am.	bg. Manson	E. T. Page.
	schr. Pardon G. Thomsen	A. B. Chase.
Ger.	bk. Pilian	G. Gerlach.
	Richard	A. von Seggern.
	sp. Shakspere	Carl Muller.
Br.	bk. Salina	John Peterson.
Am.	bk. Sarah	L. R. Hale.
	bg. Stacy Clark	C. M. Haskell.
Finn.	bk. Toivo	W. H. Snellman.
It.	bk. Teresa Accame	G. Buetta.
Am.	bg. Water Witch	Max Knaebel.
Ger.	bk. Western Chief	Fr. Sander.

UNITED STATES SIGNAL SERVICE

MONTHLY WEATHER REVIEW.

VOL. XV. WASHINGTON CITY, AUGUST, 1887. No. 7.

INTRODUCTION.

This REVIEW treats generally the meteorological conditions of the United States and Canada for August, 1887, and is based upon reports of regular and voluntary observers of both countries. Descriptions of the storms which occurred over the north Atlantic Ocean during the month are also given, and their approximate paths shown on chart i, on which also appears the distribution of icebergs and field ice reported, and the limits of fog-belts to the westward of the fortieth meridian. In tracing the centres of the paths of these storms, data from the reports of two hundred and nineteen vessels have been used. The severe disturbances which attended the passage of ocean depressions numbers 5 and 8 constituted a noteworthy feature of the month. The aggregate quantity of ice encountered on the southeast edge of the Banks of Newfoundland exceeded the average amount reported for corresponding months of previous years. Fog was less frequently encountered in the trans-Atlantic routes west of the fortieth meridian than during the preceding month.

The average number of areas of low pressure for August during the last fourteen years is ten; on chart i for the present month are traced the paths of eight such areas.

The mean temperature of August over the entire country differs but slightly from the normal; in the southern districts the month was somewhat warmer than the average August, while in northern sections it was slightly cooler.

The rainfall was very heavy in portions of the south Atlantic states, but there was a general deficiency in all other districts east of the Mississippi. From the upper Missouri valley westward to Washington Territory the rainfall was above the average, and below the average over the southwestern part of the country.

With this issue of the REVIEW the numbers of the charts showing precipitation and departures from normal pressure and temperature will be reversed. In future the chart showing departures from normal pressure and temperature will be designated as number iii, and the precipitation chart will be numbered iv.

In the preparation of this REVIEW the following data, received up to September 20, 1887, have been used, viz., the regular tri-daily weather-charts, containing data of simultaneous observations taken at one hundred and thirty-three Signal Service stations and twenty-one Canadian stations, as telegraphed to this office; one hundred and seventy-three monthly journals and one hundred and sixty-five monthly means from the former and twenty-one monthly means from the latter; two hundred and seventy-three monthly registers from voluntary observers; fifty-nine monthly registers from United States Army post surgeons; marine records; international simultaneous observations; marine reports through the co-operation of the "New York Herald Weather Service;" monthly weather reports from the local weather services of Arkansas, Colorado, Dakota, Illinois, Indiana, Iowa, Kansas, Michigan, Minnesota, Mississippi, Nebraska, New England, New Jersey, New York, North Carolina, Ohio, Oregon, South Carolina, and Tennessee; and the Central Pacific Railway Company; trustworthy newspaper extracts, and special reports.

ATMOSPHERIC PRESSURE (expressed in inches and hundredths).

The distribution of mean pressure for August, 1887, determined from the tri-daily telegraphic observations of the Signal Service, is shown by isobarometric lines on chart ii. Two areas of maximum pressure, indicated by the isobar of 30.0, are shown on the chart for August; one of these areas covers the Lake region, and the other the western portion of Washington Territory. The barometric means are least over California and the southern plateau, the area of minimum pressure, indicated by the isobar of 29.75, including portions of California, Nevada, and Arizona. The regions of maximum and minimum pressure cover comparatively small areas; the pressure over nearly the whole country being evenly distributed, the means generally ranging from 29.9 to 29.95.

As compared with the mean pressure for the preceding month, an increase is shown over the northern part of the country from the Missouri Valley eastward to the New England and middle Atlantic coasts, generally ranging from .01 to .05, except over the Lake region, where it amounts to from .06 to .09. In all other portions of the country the mean pressure for August is below that for July. Along the Gulf coast, and in the Rocky Mountain region, the decrease ranges from .05 to .09, and on the Pacific coast from .09 to .11.

The departures from the normal pressure for the various stations are given in the tables of miscellaneous meteorological data; they are also graphically exhibited on chart iii (formerly chart iv) by lines connecting stations of normal or equal abnormal values. The mean pressure for August is below the normal throughout the United States, with the exception of the region extending along the northern border from Dakota to Lake Huron, where the mean pressure is from .01 to .05 in excess of the normal. While the mean pressure over much of the country is below the normal the deficiencies are not marked; they nowhere exceed .07, and over a large part of the country are less than .05.

BAROMETRIC RANGES.

The monthly barometric ranges at the various Signal Service stations are also given in the table of miscellaneous data. The ranges for August closely agree with the normal barometric ranges for this month. They are greatest in the upper Missouri valley and the eastern part of the northern slope; they are least in the southwestern part of the country from the lower Mississippi river to the Pacific coast. The following are some of the extremes:

Greatest.	Inch.	Least.	Inch.
Bismarck, Dak	0.88	Brownsville, Tex	0.22
Deadwood, Dak	0.87	San Diego, Cal	0.22
Poplar River, Mont	0.83	Galveston, Tex	0.24
Fort Sully, Dak	0.81	Corpus Christi, Tex	0.24
Fort Maginnis, Mont	0.80	Los Angeles, Cal	0.25
Fort Buford, Dak	0.79	Fort Apache, Ariz	0.25

AREAS OF HIGH PRESSURE.

Six areas of high pressure were observed within the limits of the region of observation during the month. Five of these areas appeared first on the north Pacific coast, four of which passed to the east of the Rocky Mountains, and three were traced across the continent and disappeared off the New England coast. One area of high pressure moved southward from north of the Maritime Provinces and disappeared to the southeast of Nova Scotia. The general course of movement of these areas was to the eastward while the centre of greatest pressure remained over the continent. In approaching from the north Pacific the direction of movement was apparently to the north of east, and while passing over the Atlantic from the north Atlantic coast the general direction of movement was to the south of east. At no time during the month was the centre of greatest pressure to the south of latitude 40°. The high areas which passed to the east of the Rocky Mountains apparently inclined to the southeastward while approaching the upper Mississippi valley, after which the direction of movement was directly eastward until the centre reached the coast line.

I.—On the morning of the 1st this area of high pressure was apparently approaching from the north Pacific west of Oregon. It remained central near the coast line during the 2d and 3d, moving slowly to the northeast, and on the morning of the 4th had passed to the north of Washington Territory and was central in British Columbia, it having been preceded in that region by the area of low pressure traced as number i. This area of high pressure seems to have reached its highest latitude at this report; after which it moved southeastward, following the general course of the Missouri Valley, and becoming more contracted and more clearly defined; slight areas of low pressure being at that time central over the Lake region and southward over Colorado and New Mexico. The southeasterly movement continued during the 5th, causing the area of low pressure to the southward to disappear, while the pressure generally increased over the eastern slope of the Rocky Mountains. After the centre reached the lower Missouri valley the course of this area changed to the eastward and it passed over the Lake region to the upper Saint Lawrence valley, where it was central on the morning of the 7th. The pressure increased to the southward on the Atlantic coast during the 7th and 8th, while the centre of greatest pressure moved southeast from the upper Saint Lawrence valley over New England to the Atlantic, where it was last observed on the morning of the 9th central off the New Jersey coast.

II.—This area was first observed to the north of the Gulf of Saint Lawrence on the morning of the 12th, when it moved slowly southward, covering the Maritime Provinces and New England during the 3d, the centre appearing to pass southward over Nova Scotia, but the increase of pressure extended over the Atlantic coast as far as the south Atlantic states, preceded by showers and attended by cool northeasterly winds. It disappeared during the 5th, moving to the southeastward over the Atlantic.

III.—This area appeared on the north Pacific coast on the morning of the 8th, the centre apparently being to the north of Washington Territory. It moved directly eastward, extending over the northern Rocky Mountain districts, and by the morning of the 9th the centre of greatest pressure had reached northwestern Dakota; there being a trough of low pressure extending from Arizona northeastward to Upper Canada, separating this area of high pressure from that described as number i, which on the morning of the 9th covered the states on the Atlantic coast. This area of high pressure decreased in energy and passed eastward to the north of the Lake region, and disappeared without causing a marked change in the meteorological conditions within the limits of the United States.

IV.—This area was first observed as central in the Rocky Mountain region, south of Montana, but probably approached to that position from British Columbia. It moved slowly to the south of east over northern Dakota. From this region the movement of this area was first eastward to a point near, and north of, Lake Superior and afterwards to the southeastward over the Great Lakes during the 12th and 13th, attended by northerly winds and fair weather in the northeastern portion of the United States, and possessing but slight energy, the pressure at the centre having diminished during the passage of this area to the eastward. It was last observed as central in eastern New York on the 14th, after which it moved southeastward in advance of an area of low pressure which on that date was moving eastward over the upper Mississippi valley.

V.—This was one of the three principal areas of high pressure which were observed on the Pacific coast and moved eastward, crossing the continent and disappearing as well-defined areas of high pressure over the Atlantic coast. It appeared off the Oregon coast on the morning of the 20th, moving slightly to the north of east until the centre passed to the east of the Rocky Mountains, when the movement was easterly. After reaching the centre of the continent it remained almost stationary during the 23d, 24th, and 25th, covering northern Minnesota and Manitoba, and causing light frosts in that section on the morning of the 24th. From this region it moved slowly to the southeastward, covering the Great Lakes during the 26th, 27th, 28th, and 29th; after which the movement was apparently to the southeast, and the reports indicated that after reaching the coast line it was reinforced by a second high area from the north Atlantic. At the close of the month this high area was approximately located as central to the east of Nova Scotia.

VI.—This area appears to have approached the coast of Washington Territory from the Pacific on the 30th as a slight area of high pressure, and continued in that region; the pressure increasing in that section on the last day of the month.

AREAS OF LOW PRESSURE.

Eight areas of low pressure were traced over the United States and adjoining territories during the month of August, while two well-defined tropical storms passed along the Atlantic coast, following the general course of the Gulf Stream and causing dangerous gales along the coast from Florida to the Maritime Provinces, although the winds at the coast stations during the passage of these storms were not unusually high, except on the east coast of Florida, yet the change of direction served to locate approximately the progress of the storm.

The storms traced eastward over the continent all passed north of the Ohio Valley and reached the Atlantic coast north of Cape May, N. J. Three areas of low pressure approached the stations from the north of Montana and apparently originated to the westward of the Rocky Mountains. Three were first observed in the central Rocky Mountain region, and two seem to have developed in the Mississippi Valley. Those originating to the north of the United States moved slightly south of east towards the Lake region, and afterwards changed direction to the northeast upon reaching the vicinity of the Saint Lawrence Valley. Of the five low areas first located within the centre of the United States, the general direction of movement was slightly to the north of east; the course becoming more northerly after approaching the Atlantic coast.

The following table shows the latitude and longitude in which each area of low pressure was first and last observed and the average hourly velocity of each:

Areas of low pressure.	First observed.		Last observed.		Average progress in miles per hour.
	Lat. N.	Long. W.	Lat. N.	Long. W.	
	° ′	° ′	° ′	° ′	
No. I	52 00	115 00	50 00	66 00	24.0
II	54 00	113 00	53 00	100 00	30.0
II	45 00	107 00	51 00	86 00	27.0
III	40 00	105 00	52 00	99 00	39.0
IV	54 00	105 00	44 00	60 00	27.0
V	38 00	102 00	39 00	73 00	26.0
VI	36 00	92 00	48 00	62 00	31.0
VII	40 00	108 00	33 00	100 00	24.0
VIII	43 00	90 00	41 00	75 00	23.0

Average rate of progress, 31.4 miles per hour.

I.—During the 1st and 2d of the month the pressure was low in the Rocky Mountain region and in Arizona, but on the afternoon of the 2d this area apparently developed north of Montana, immediately in advance of the area of high pressure which was then moving eastward from the Pacific, and extended over the north Pacific coast. The barometer continued low west of the Mississippi and in the Rocky Mountain region, and a secondary depression developed on the eastern slope of the Rocky Mountains and in the upper Mississippi valley, attended by heavy local rains during the 3d and 4th, while the principal depression moved eastward towards the Lake region, where it was central near Lake Superior on the afternoon of the 4th. The area of rain attending this depression extended southward over the Ohio Valley and Tennessee, thence eastward to the Atlantic coast, and accompanied the disturbance as it moved eastward and northeastward over the Saint Lawrence Valley. The winds increased in force after shifting to westerly, and this storm apparently increased in energy after reaching the Atlantic coast, although the barometer was lower at the centre when the storm was first observed north of Montana than it was when last observed. In the lower lake region, Ohio Valley, Tennessee, and at southern Rocky Mountain stations the highest temperatures of the month occurred during the prevalence of this low area.

II.—This disturbance appeared at midnight of the 5th near the region where number i was first observed, and while said disturbance was central in the Saint Lawrence Valley. It remained for twenty-four hours north of Montana and Dakota, when a secondary disturbance developed in the northern Rocky Mountain region, and the principal disturbance apparently passed to the northeast of the stations of observation. On the morning of the 7th this secondary depression extended over the upper Missouri valley, and it moved eastward over Dakota and Minnesota during the 7th and 8th, attended by rains in the northern portions of the districts named. The barometer rose during the easterly movement of this depression, and it disappeared to the northeast of Lake Superior without producing any marked change in the weather conditions east of the Mississippi.

III and IV.—The tri-daily reports received during the 8th and 9th indicate the presence of a barometric depression over the plateau regions, which apparently moved slowly to the eastward and formed the area of low pressure traced as number iii, which was central in northern Colorado on the morning of the 9th. This disturbance extended to the northeast, and moved over Nebraska, Iowa, and Minnesota during the 9th and 10th, developing but slight energy. The weather remained fair and very warm in the southern quadrants, within which maximum temperatures generally ranged near or exceeded 100°. Local storms occurred in the upper lake region and the upper Mississippi valley during the passage of this disturbance, rains generally occurring about the time when the line of lowest pressure passed the stations. During the transit of this low area over Colorado to the northeast, a depression appeared to the north of Montana, moving slowly to the southeastward, and at midnight of the 10th these disturbances apparently united to the north of Lake Superior, forming the area afterwards traced as number iv. The rains attending this disturbance partially relieved the drought sections of the upper lake region, northern Illinois, and northeastern Iowa. The course of disturbance after the union of the two depressions, previously described, was to the southeast over the upper Saint Lawrence valley and New England during the 11th and 12th, attended by heavy local rains as far south as Virginia and the upper Ohio valley. It was central on the north New England coast on the afternoon of the 12th, after which it moved to the northeast over Nova Scotia, and it was last observed as central near Sydney on the morning of the 13th.

V.—This disturbance, although first noted as central in western Kansas, probably originated to the westward of the Rocky Mountains, over the plateau regions, and extended as a feeble disturbance during its passage over the eastern slope of the Rocky Mountains, attended by local showers, but it became more clearly defined when passing eastward over the Mississippi Valley. Although the depression at the centre of the disturbance was but slightly below the normal, its movement could be traced by the direction of the wind at the stations within the disturbance. The rains were unusually heavy in the upper Ohio valley and along the southern portions of the Lake region. As it approached the middle Atlantic coast, secondary disturbances were formed to the south, which were accompanied by very heavy local rains in North Carolina and Tennessee. The centre passed to the east of the coast line on the New Jersey coast during the night of the 15th, and the succeeding reports from vessels indicate that this storm increased greatly in energy immediately after passing over the Atlantic. Severe gales occurred off Nantucket, Mass., and south of Halifax, N. S., indicating that the course of the storm changed to the north of east.

VI.—The barometer was below the normal at the southern Rocky Mountain stations during the 16th, and this condition resulted in the development of a slight disturbance in northern Texas, which passed to the central Mississippi valley, attended by local rains, on the 16th and 17th. The centre of this disturbance passed directly over the region of drought, and the rains attending it were a great benefit, although the crops had been permanently injured by the long-continued drought. This storm passed directly over the Ohio Valley, middle Atlantic, and New England states, during the 17th and 18th; it increased in energy during its easterly course, the pressure decreasing from 29.80 to 29.60, and below, by midnight of the 18th, when the storm was central near Eastport, Me. Severe southerly gales occurred on the New England coast during the 18th, when the storm was clearly defined and of slight area. This disturbance reached its maximum energy while passing over New England, although the pressure continued to decrease while the centre was passing over the Maritime Provinces. Westerly gales are reported from the upper Saint Lawrence valley on the 19th and strong westerly winds continued on that date on the New England coast.

VII.—At midnight of the 19th an area of low pressure was central in western Colorado, the barometer being generally below the normal at the Rocky Mountain stations. This condition of pressure continued during the 20th, with an apparent easterly movement when the centre of disturbance was over the central eastern slope of the Rocky Mountains. This area of low pressure developed but slight energy, and was apparently forced southward over Texas by the advance of an area of high pressure over the northern Rocky Mountain region; after midnight of the 21st it ceased to exist as a well defined area of low pressure.

VIII.—This storm developed in the upper Mississippi valley in advance of the area of high pressure above referred to, and it was first located central in southern Wisconsin on the morning of the 22d. The rain-area attending this storm covered the greater portions of the United States east of the Mississippi and Missouri valleys. The storm moved eastward over the southern portion of the Lake region to the middle Atlantic coast, where it was last observed as central on the morning of the 23d.

During the passage of this storm over the Lakes, a cyclone appeared to the southeast of Florida and moved along the Atlantic coast, following the general course of Gulf storms, and causing severe gales near the coast from the 22d to 26th. This storm was preceded by a cyclone which moved over approximately the same course from the 19th to the 22d. The tracks of the centres of these disturbances will be found on chart number i. In locating the centres of these disturbances a large number of official reports from regular correspondents, and in addition a number furnished through the courtesy of Commander J. R. Bartlett, Hydrographer, Navy Department (for which the Service desires to acknowledge its indebtedness), were utilized, especially in determining the tracks of the centres of the tropical storms traced on chart number i.

NORTH ATLANTIC STORMS DURING AUGUST, 1887.

[*Pressure in inches and millimetres; wind-force by Beaufort scale.*]

The paths of the depressions that have appeared over the north Atlantic Ocean during the month are determined, approximately, from international simultaneous observations furnished by captains of ocean steamships and sailing vessels; abstracts of ships' logs and other data collected by the Signal Service agencies at the ports of New York, Boston, and Philadelphia; reports received through the co-operation of the "New York Herald Weather Service;" and from other miscellaneous data received at this office up to September 21, 1887.

Of the nine depressions traced, three originated in the tropics; five advanced eastward over Newfoundland; and one left the American coast in about N. 38°. Three storms traversed the ocean from coast to coast, of which two passed eastward from the Gulf of Saint Lawrence, and one moved from the West Indies along the course of the Gulf Stream to the sixtieth meridian, and thence advanced northeast to the northward of the fifty-fifth parallel.

The depressions presented the usual characteristics of August north Atlantic storms, and, as a rule, exhibited a marked loss of energy after passing to the eastward of the thirtieth meridian. The tropical cyclones which advanced toward the Florida coast north of the West Indies, and subsequently moved northeast parallel with the American coast, were of the energetic and destructive type of storms peculiar to that region during August, and while they probably equaled in strength the tropical storms traced for corresponding months of previous years their destructive features were less apparent, owing to the course of their paths being too far to the northward to occasion disastrous winds or rains over the larger and more important West India Islands. These cyclones, more particularly the one traced as number 8, exhibited a great loss of energy during the periods occupied by their northward curve off the Florida coast, and, although their strength was augmented during their subsequent passage along the Gulf Stream, their influence along the Atlantic coast of the United States was not so severely felt on land as during the prevalence of storms of this class in previous years. The storm which is given a probable track westward over the Caribbean Sea was of slight energy.

The depressions traced over mid-ocean were rather evenly distributed throughout the month, and were, as a rule, accompanied by disturbances of pronounced strength. Over the ocean east of the twentieth meridian the weather was generally fine, while during the first half of the month settled weather prevailed off the American coast south of the forty-fifth parallel. The barometer continued relatively high in the vicinity of the Azores during the entire month, the fluctuations observed being incidental to the passage of cyclonic areas to the northward of the forty-fifth parallel.

The following are brief descriptions of the depressions traced:

1.—This depression was central on the 1st over the Gulf of Saint Lawrence, whence it moved east to N. 49°, W. 47° by the 2d, with central pressure about 29.80 (756.9); by the 3d the storm-centre had moved south of east to N. 48°, W. 38°, and thence advanced east and east-northeast to the west coast of Ireland by the 6th, without evidence of marked energy.

2.—The presence of this depression to the southward of San Domingo was indicated by vessel reports of the 5th, whence it apparently moved eastward over the Caribbean Sea into the Gulf of Mexico by the 8th, accompanied by rain and fresh gales. Its course subsequent to the 7th cannot be determined, owing to an absence of reports. Capt. A. P. Goodman, of the bark "Florence," reports, relative to this depression, as follows: "5th, 4.30 a. m., Greenwich time, in East Harbor, Caicos Islands, threatening weather, barometer 29.61 (752.1) and falling; 7.30 a. m., wind and sea rising rapidly; 8.30 a. m., barometer 29.57 (751.1), wind a hard gale, with heavy squalls and rain and high sea from se.; 10 a. m., a very heavy se. squall of wind and rain, barometer 29.55 (750.6), gale at its height; 11.30 a. m., barometer rising and wind moderating."

3.—This depression was central off the north coast of Newfoundland on the 8th, with hard gales and rain to the fortieth parallel; by the 9th the storm-centre had moved southeast to the eastern edge of the Banks of Newfoundland, whence it circled to the northeastward of the Banks during the two following dates, accompanied by moderate to fresh gales and rain; during the 12th, 13th, and 14th the depression moved eastward with a small display of energy, and apparently dissipated over the ocean to the southward of the British Isles.

The following are reports of disturbances encountered during the passage of this depression: Mr. H. H. Herbert, observer on the s. s. "Worcester," Captain Stamper, commanding, reports a strong gale on the 8th; wind veered from s. to n.; lowest barometer, 29.45 (748.0), at 4 p. m., in N. 46° 58′, W. 52° 00′. Capt. J. James, of the s. s. "Pawnee," reports a fresh gale on the 8th; wind veered from sw. to n.; lowest barometer, 29.80 (756.9), at 6 p. m., in N. 37° 54′, W. 56° 36′. Capt. W. Boggs, of the s. s. "Indiana," reports a heavy gale on the 7th; wind veered from se. to sw.; lowest barometer, 29.51 (749.5), at 3 p. m., in N. 41° 18′, W. 55° 15′.

4.—This depression passed eastward over the northern portion of Newfoundland during the 14th and was central on the 15th in about N. 52°, W. 46°, whence it passed east and apparently dispersed over mid-ocean after the 16th. On the 13th a depression of pronounced energy, not charted, developed south of Newfoundland, and passing northward united with depression number 4 which was central over the Gulf of Saint Lawrence on the 14th. The following special reports refer to this depression: Capt. A. de Mugica, of the s. s. "Hugo," reports a strong gale on the 12th and 13th; wind veered from e. to sw.; lowest barometer, 29.53 (750.0), at 11 a. m., in N. 42° 50′, W. 53° 30′. Capt. H. W. Snellman, of the bark "Toivo," reports a strong gale on the 13th; wind veered from se. to wnw.; lowest barometer, 29.42 (747.3), at 4 a. m., in N. 42° 56′, W. 54° 39′.

5.—This depression apparently originated to the eastward of the Windward Islands and moved northwestward to about N. 22°, W. 63° by the 16th; moving slightly north of west, the depression was central on the 19th off the east coast of southern Florida, whence it circled northward and followed the course of the Gulf Stream until the 23d, on which date it was central in N. 50°, W. 31°. During the next five days the storm-centre pursued a diversified course over mid-ocean in the vicinity of the fifty-fifth parallel, and on the 29th had apparently moved westward and united with depression number 8 which had advanced from the westward. During the passage of this storm along the coast of the United States it was attended by hurricanes of exceptional violence; on the 22d, when central southeast of Newfoundland, a marked rise in central pressure and a considerable loss of energy were shown; with its advance over mid-ocean, however, the depression acquired great energy and was accompanied by barometric pressure ranging below 29.00 (736.6) and gales of hurricane force throughout the remainder of its course.

The following special reports have been rendered relative to disturbances encountered during the passage of this depression: Capt. J. Wilder, of the s. s. "City of San Antonio," reports a hurricane on the 19th and 20th; wind veerred from ese. to sw.; lowest barometer, 28.56 (725.4), at 1.45 a. m. of the 20th, in N. 33° 48′, W. 76° 36′. Capt. Frank Stevens, of the s. s. "Manhattan," reports: "20th, 9 a. m., off se. point of Hatteras Shoal, weather very threatening; barometer falling fast from 29.94 (760.5); wind from e.; turned ship around and ran to the northward as long as I possibly could for the heavy quartering sea. 11 a. m., hove-to on starboard tack, head to the eastward. 1 p. m. to 3.30 p. m., storm very severe, the wind at times estimated ninety to one hundred miles per hour, for it would flatten the sea down, and make it all foam; the air was thick with spray; during lulls a tremendous sea would arise; barometer at 1 p. m, 29.13 (739.9), wind se. 3.30 p. m.,

barometer commenced to rise, and wind veered to s. and sw., and commenced to moderate, when it hauled to nw. and cleared off. I had no warning of this storm until it was on me, for when I turned to run from it the barometer had been stationary at 29.94 (760.5) all night, the first part of the night being clear and starlit."

Capt. Robert Mount, of the steam schooner "Louis Bucki," reports: "A hurricane on the 19th and 20th; lowest barometer, 29.00 (736.6), at 3 a. m. of the 20th, in N. 34° 25′, W. 76° 50′, wind set in from se. to e., and steadily increased from 11 p. m. of the 19th to 3 a. m. of the 20th; after a lull of fifteen minutes wind suddenly shifted to wnw., blowing squally and hard, then moderated gradually. At 10 a. m. of the 19th, thirty minutes before any serious increase in wind, I experienced three huge seas, resembling what are described as tidal waves, each one sweeping the decks and doing considerable damage. The cyclone appeared to be travelling nne., and, considering our position at the commencement (about five miles to windward of Cape Lookout), I was unable to avoid the centre, which passed right over us. My barometer fell at the rate of two-tenths of an inch per hour, and rose as rapidly."

Capt. L. Dexter, of the s. s. "City of Para," reports: "20th, noon, in N. 23° 40′, W. 74° 16′, wind fresh from wnw., cloudy and threatening weather, heavy ne. swell, barometer 29.75 (755.6), I suppose we are in the sw. quadrant of a cyclone; I steered n. by e. ½ e. forty-four miles until 4 p. m., when barometer stood at 29.60 (751.8), with a wnw. gale; slowed engine lowest possible speed, heading nne., took in all sail; 8 p. m., barometer 29.51 (749.5), hard wsw. gale with squalls and rain, increased speed to six miles per hour, making nne. course; midnight, barometer 29.41 (747.0), increasing sw. wind, squally, steering n., eleven miles per hour. 21st, 4 a. m., barometer 29.35 (745.5), hard s. gale, squally with blinding rain; 8 a. m., barometer 29.51 (749.5), very hard sse. gale, terrific squalls, blinding rain, heavy sea, ship running before it; noon, barometer 29.67 (753.6), wind se., moderate, weather clearing in ne.; wind continued se. and barometer rose rapidly." This vessel evidently entered the southwest quadrant of depression number 5 during the night of the 19–20th, and during the 20th and 21st was within the area of depression number 8.

Capt. C. L. Rigby, of the s. s. "Wyoming," reports: "21st, noon, Greenwich time, in N. 43° 32′, W. 59° 08′, barometer 29.79 (756.7), air 66°, light variable winds mostly southerly, with rain, wind backing to eastward; 4 p. m., in N. 43° 17′, W. 60° 16′, strong ese. wind, with heavy rain, wind veering to sw., barometer 29.70 (754.4), air 69°; 6.10 p. m., wind fell light and veered round by w. to nw. and ne., and increased to hurricane force with a very heavy sw. sea; 7.30 p. m., in N. 43° 02′, W. 60° 50′, barometer 29.05 (737.9), air 65°, still blowing the same, with heavy rain and a very heavy confused sea; 8 p. m., wind moderating and backing to nw., barometer 29.16 (740.7), air 62°; midnight, in N. 42° 46′, W. 61° 36′, strong nw. breeze and clearing weather, barometer 29.72 (754.9), air 67°."

Capt. W. Rea, of the s. s. "Bassano," reports a whole gale on the 20th and 21st; wind backed from sw. to se. and n.; lowest barometer, 29.35 (745.5), at 1.30 a. m. of the 21st, in N. 40° 35′, W. 68° 04′. The gale was accompanied by very heavy rain, terrific thunder and lightning, and a confused sea. Capt. A. G. Braes, of the s. s. "State of Nebraska," reports a hurricane of short duration on the 21st; wind backed from se. to nne.; lowest barometer, 29.21 (741.9), at noon, in N. 42° 33′, W. 62° 04′. Third Officer G. E. Doyle, of the s. s. "British Prince," Capt. S. Nowell, commanding, reports a hurricane on the 20th and 21st; wind backed from s. by e. to se. by s., and shifted suddenly to nw. by n.; lowest barometer, 29.09 (738.9), at 11.30 p. m., in N. 39° 54′, W. 69° 20′. Capt. W. Topser, of the s. s. "Rhein," reports a ssw. to wnw. storm on the 21st; lowest barometer in N. 40° 05′, W. 66° 20′. Capt. G. D. Spicer, of the sp. "Charles S. Whitney," reports a hurricane on the 21st and 22d; wind veered from sse. to nw.; lowest barometer, 29.39 (746.5), at 4 a. m. of the 22d, in N. 42° 15′, W. 52° 50′.

Capt. R. T. Jones, of the s. s. "Galileo," reports: "22d, in N. 42° 22′, W. 51° 19′, at noon; 3.30 a. m., a strong gale from sw., with high, rough sea; 7.30 a. m., shifted to w., barometer 29.44 (747.8); 11 a. m., shifted to nw., barometer 29.58 (751.3), and gradually decreased into strong breeze." Second Officer Allan Call, of the s. s. "Ohio," Capt. P. R. W. Sargent, commanding, reports: "22d, 10 a. m., in N. 45° 00′, W. 41° 30′, wind s., increasing and hauling to westward; 4 p. m., wind falling light; 6 p. m., wind increasing from nw., barometer 29.57 (751.1); 7 p. m., blowing a hurricane, barometer 29.08 (738.6); 7.30 p. m., moderating, strong gale." Capt. W. Tyson, of the s. s. "Holland," reports a fresh gale on the 22d; wind backed from se. to n.; lowest barometer, 29.12 (739.6), at 11.44 a. m., in N. 47° 10′, W. 41° 30′. Capt. J. H. Stiefel, of the s. s. "Europa," reports a fresh gale on the 22d and 23d; wind backed from ne. to nw.; lowest barometer, 29.20 (741.7), at 11.09 a. m., in N. 48° 23′, W. 38° 09′.

Capt. W. McMickan, of the s. s. "Umbria," reports a hurricane on the 23d and 24th; wind backed from se. to e. and nw.; lowest barometer, 28.85 (732.8), at 1 p. m. of the 23d, in N. 49° 40′, W. 31°, 40′. Capt. S. Brooks of the s. s. "Arizona," reports: "23d, noon, Greenwich time, in N. 50° 51′, W. 26° 30′, barometer 29.34 (745.2), wind s., moderate gale, barometer falling very rapidly and wind backing to se.; 9 p. m., in N. 50° 30′, W. 30° 00′, barometer 28.73 (729.7), wind had backed to nw. round by e.. ne., and n., barometer began to rise, and a furious nw. gale prevailed till after midnight." Capt. T. L. Evans, of the s. s. "Mineola," reports a hurricane on the 23d and 24th; wind veered from se. to w. and nne.; lowest barometer, 29.00 (736.6), at 8 p. m. of the 23d, in N. 51° 10′, W. 30° 30′. Capt. W. Abbott, of the s. s. "Marengo," reports a whole gale on the 23d and 24th; wind veered from sw. to wnw.; lowest barometer, 28.74 (730.0), at 6 p. m. of the 23d, in N. 49° 18′, W. 26° 33′.

Capt. W. Janes, of the s. s. "Oxford," reports a whole gale from the 23d to 27th; wind veered from se. to nw.; lowest barometer, 28.69 (728.7), at 2.30 p. m. of the 23d, in N. 50° 21′, W. 30° 39′. Fourth Officer Lossius, of the s. s. "Britannic," Capt. H. Parsell, commanding, reports a gale on the 27th; wind veered from se. to wnw.; lowest barometer, 29.09 (738.9), in N. 51° 06′, W. 23° 58′. Capt. W. Kuhlewein, of the s. s. "Gellert," reports a whole w. to nw. gale from the 27th to 29th; lowest barometer, 29.26 (743.2), at 5 a. m. of the 27th, in N. 49° 40′, W. 23° 20′. Capt. W. Skjödt, of the s. s. "Island," reports a fresh gale on the 26th and 27th; wind backed from sw. to e. and nw.; lowest barometer, 28.84 (732.5), at 9 a. m. of the 25th, in N. 56° 6′, W. 26° 35′. Capt. W. J. Boggs, of the s. s. "Indiana," reports a strong gale on the 26th and 27th; wind veered from sw. to nw.; lowest barometer, 29.13 (739.9), at noon of the 26th, in N. 50° 52′, W. 21° 05′.

6.—This depression was central on the 16th over the Gulf of Saint Lawrence, whence it moved eastward over the northern portion of Newfoundland by the 17th; by the 18th the centre of depression had moved southeast and united with depression number 7 which had advanced from the southwest.

7.—This depression left the American coast in about N. 38° and on the 16th was central in N. 38°, W. 70°, with fresh to strong gales and rain; by the 17th the storm-centre had advanced to N. 40°, W. 60°, and thence passed to N. 45°, W. 47°, by the 18th, where it united with depression number 6; moving rapidly northeast, the centre of depression was central on the 19th in about N. 52°, W. 29°, after which it disappeared beyond the region of observation.

The following special reports indicate the general character of the disturbances attending this depression:

Capt. W. Rea, of the s. s. "Bassano," reports a strong gale on the 17th; wind veered from se. to sw.; lowest barometer, 29.62 (752.3), at 3 p. m., in N. 40° 40′, W. 54° 40′. Captain Schade, of the s. s. "Polaria," reports a strong nw. to wnw. gale on the 19th and 20th; lowest barometer, 29.71 (754.6), at 1 p. m. of the 19th, in N. 49° 32′, W. 38° 30′.

8.—The presence of this depression to the eastward of the

Windward Islands was indicated by vessel reports of the 19th; by the 20th the centre of depression had moved west-northwest to about N. 22°, W. 66°, whence it is traced to N. 26°, W. 76° by the 21st. On this date south to west gales of hurricane force prevailed over the eastern portion of the Bahama Islands; in the vicinity of the thirtieth parallel fresh easterly gales were reported, while off the Florida coast strong northerly gales prevailed. During the 22d and 23d the storm-centre circled slowly northward, with a marked decrease in energy; by the 24th it had advanced to N. 32°, W. 76°, and during its northeast passage along the course of the Gulf Stream during the next two days it was attended by hurricanes of exceptional violence.

During the 26th and the early morning of the 27th the depression advanced northeast to the fiftieth parallel, its path being to the westward of the Banks of Newfoundland and touching the southeastern extremity of Newfoundland. This direction of movement was, presumably, occasioned by an area of relatively high barometric pressure which occupied the ocean to the southeastward of the Banks, whereby the depression was deflected to a more northerly course than that which it had previously held. During the 28th and 29th the centre of depression passed too far to the northward of the region of observation to permit of other than an approximate course being given to its path; by the 30th, however, its presence to the westward of the British Isles, in about N. 57°, was clearly shown, and its subsequent passage to the north of Scotland was indicated by reports of the 31st. This storm was remarkable both by reason of the extent of territory it traversed and on account of the great energy displayed throughout its entire course, the only period during which a diminution of strength was observable being on the 22d and 23d, during its re-curve over, and to the northward of, the Bahamas.

The general character of the disturbances which attended its passage is shown by the following special reports:

Mr. W. H. Carter, of the s. s. "Earnmoor," Capt. R. J. Grey, commanding, reports: "19th, 11 p. m., left Santiago with a light nw. breeze and hazy weather, barometer falling slowly and sky having every appearance of an approaching hurricane. 20th, weather fine, with light to fresh nw. and w. to wsw. breeze and falling barometer. 21st, in N. 23° 35′, W. 74° 16′, at noon, at 6 a. m., fine and clear, fresh sw. breeze; 7.30 a. m., heavy squall of wind and rain from sw., lasting one hour, and a heavy northerly sea, falling barometer; 2.40 p. m., passed Watlings Island with a fresh and increasing southerly gale and a heavy sea, also a short n. sea and terrific squalls accompanied with rain. 22d, in N. 27° 06′, W. 74° 20′, a heavy gale and tremendous sea running, with torrents of rain, brought ship to the wind which was sse. at 4 a. m., with slowly rising barometer; 5 a. m., barometer again falling, se. gale and ssw. sea, with very unsteady barometer continued throughout the day. 23d, in N. 30° 44′, W. 74° 36′, at noon, fresh gale continued up to 4 p. m., then moderated; midnight, fresh gale again from ese., with falling barometer. 24th, in N. 33° 51′, W. 74° 40′, at noon, fresh gale, falling barometer, heavy sea; towards noon it blew a heavy gale from e. and ssw., with terrific squalls and rain; 4 p. m., hard gale and high sea, falling barometer, fresh gale continued up to midnight. 25th, in N. 36° 56′, W. 74° 49′, at noon, at 4 a. m. wind hauled to ne., with fresh gale and tremendous sea; noon, strong northerly gale and rising barometer, in p. m. the wind moderated."

Captain Legoe, of the s. s. "Pomona," reports: "20th, after leaving Cape Maysi, Cuba, wind came into the nw., moderate; wind freshened at night and sky looked very red; during night wind hauled to westward and freshened, with squalls and heavy rain. 21st, at Watlings Island, weather looked very dirty, and barometer continued falling; wind hauled to s. with terrific squalls and heavy rain; ship running before the wind and sea; at 5.30 p. m., hove the ship's head to the sea, barometer still falling; between 10 and 11 p. m., blew very hard, afterwards moderating. 22d, in N. 26° 44′, W. 74° 11′, took off crew of the wrecked schooner "Mary E. Douglass," which had been caught in two hurricanes. 23d, in N. 30° 56′, W. 74° 20′, at noon, strong gale from se. and high sea with rain. 24th, in N. 34° 24′, W. 74° 20′, at noon, very squally, with rain and high seas. 25th, in N. 38° 04′, W. 72° 00′, at noon, at 5 a. m., wind changed to n. and blew a gale with very heavy sea."

Capt. Frank Stevens, of the s. s. "Manhattan," reports: "22d, 11 p. m., in N. 30° 0′, W. 80° 40′, very bad looking weather, and barometer falling rapidly, strong ene. gale and very heavy se. sea; hove-to head to the northward. 23d, 9.30 a. m., turned round and ran to southward, barometer 29.63 (752.6), wind inclined to back to northward; 11 p. m. hove-to head to eastward, hard wnw. gale, barometer 29.43 (747.5), very heavy ne. sea. 24th, 9 a. m., rising barometer, hard nw. gale. On the 23d, at sunset, the sky was full of 'mares-tails,' more than I ever saw before, and moving in all directions, the lower clouds from n.; the ones next above them from sw., then some from se., and some from ne."

Capt. Charles Brown, of the barkentine "Josephine," reports: "24th, barometer continued falling until 19 h. 30 m., in N. 38° 13′, and W. 74° 40′, to 29.65 (753.1), with light rain, and the wind gradually backed from se. to ne., when it suddenly increased to force 8; the barometer then commenced to rise, and the wind gradually increased and backed to n. by w., with increasing sea. 25th, 3 h. 15 m., sky commenced to clear, but the wind increased until 4 h. 58 m., when it blew heaviest from n. by w., force 10, with sea heavy from n. by w., after which it moderated gradually." First Officer J. C. Norton, of the s. s. Yemassee," Capt. S. C. Platt, commanding, reports: "24th, noon, in N. 37° 38′, W. 74° 50′, barometer 29.75 (755.6) and falling steadily, sea swell fast, long, and heavy, heavy clouds in e. and s.; 4 p. m., wind had backed to e., blowing in heavy gusts, with rain squalls; 8 p. m., wind ne., barometer 29.48 (748.8), hard gale; 11 p. m., barometer 29.27 (743.4), lowest, wind a hurricane. 25th, 2.40 a. m., Hatteras west, immense sea; during the day the barometer rose and wind backed to n. and nnw."

Capt. E. Wylie, of the s. s. "Catalonia," reports: "25–26th, between longitudes 58° and 68°, had very unsettled weather; wind attained force of a fresh gale, accompanied by a heavy electrical storm, balls of flame being on all extremities aloft; wind backed gradually from s. to e. and w. by n." Capt. W. McMickan, of the s. s. "Umbria," reports: "26th, in N. 42° 27′, W. 59° 20′, noon; 2 p. m., Greenwich time, barometer 29.80 (756.9), wind s., overcast and much rain, barometer falling rapidly, and wind increasing, with a high, confused sea; 3 p. m., wind se., and a tremendous sea running; wind fell very light; to all appearances in the centre of a cyclone; engines slowed; 5.30 p. m., barometer 28.65 (727.7); during a heavy squall of rain and wind the wind went to nnw. and blew with hurricane force for two hours and then gradually moderated to strong gale from nw., with high sea."

Captain Vogelgesang, of the s. s. "Rhaetia," reports a whole gale on the 26th; wind backed from nne. to w.; lowest barometer, 29.30 (744.2), at 7 a. m., in N. 41° 55′, W. 65° 00′. Capt. E. Santelli, of the the s. s. "La Gascogne," reports a hurricane on the 26th and 27th; wind backed from ese. to nw.; lowest barometer, 28.58 (725.9), at 1.30 p. m. of the 26th, in N. 42° 29′, W. 62° 00′. Second Officer Call, of the s. s. "Ohio," Capt. P. R. W. Sargent, commanding, reports: "26th, 8 a. m., in N. 41° 28′, W. 62° 02′, encountered a hurricane from sse., barometer 29.51 (749.5); noon, barometer 28.20 (716.3), wind hauled to nw., and storm continued four hours, with very high sea." Capt. G. Evans, of the s. s. "Peconia," reports a hurricane on the 26th; wind backed from ssw. to e. and nw.; lowest barometer, 28.11 (714.0), at 7 a. m., in N. 39° 19′, W. 64° 14′.

Capt. W. Tyson, of the s. s. "Holland," reports a hurricane on the 26th; wind backed from s. to n.; lowest barometer, 28.52 (724.4), at 9.53 a. m., in N. 42° 41′, W. 61° 47′. Capt. W. G. Crockhart, of the s. s. "Devonia," reports a storm on the 26th; wind veered from sse. to nw.; lowest barometer, 28.44 (722.4), at 7.15 p. m., in N. 43° 37′, W. 56° 24′. Capt. R. B. Stannard, of the s. s. "Crystal," reports a whole gale

on the 26th; wind backed from ne. to nw.; lowest barometer, 29.24 (742.7), at 11 a. m., in N. 42° 00′, W. 64° 12′. Capt. E. H. Freeth, of the s. s. "British Princess," reports a hurricane on the 26th; wind veered from se. to w.; lowest barometer, 28.67 (728.2), at 1 p. m., in N. 43° 12′, W. 60° 09′. Capt. S. Brooks, of the s. s. "Arizona," reports: "26th, 8 p. m., Greenwich time, in N. 45° 06′, W. 53° 10′, strong breeze from s., and fog, barometer 29.67 (753.6), and falling rapidly; 10 p. m., barometer 28.70 (729.0), wind a hurricane from sse., ship completely enveloped in spray; midnight, in N. 44° 50′, W. 54° 00′, barometer lowest, 28.50 (723.9), wind began hauling to westward, and barometer commenced to rise; wind settled down to hard wsw. gale, with tremendous high-breaking seas, and barometer continued to rise rapidly."

Capt. J. H. Stiefel, of the s. s. "Europa," reports a hurricane on the 26th; wind veered from sse. to w.; lowest barometer, 28.80 (731.5), at midnight, in N. 44° 10′, W. 54° 40′. Capt. G. D. Spicer, of the sp. "Charles S. Whitney," reports a hurricane on the 26th; wind backed from sse. to nw.; lowest barometer, 28.40 (721.3), at 7 p. m., in N. 42° 30′, W. 60° 30′. Capt. W. Pearce, of the s. s. "Italy," reports a heavy sw. to w. gale on the 27th; lowest barometer, 29.01 (736.8), at 1 a. m., in N. 45° 00′, W. 50° 30′. First Officer Lossius, of the s. s. "Britannic," Capt. H. Parsell, commanding, reports a strong gale from the 28th to the 30th; lowest barometer, 29.44 (747.8), on the 29th, in N. 48° 40′, W. 38° 30′.

Capt. G. de Kersabiec, of the s. s. "La Normandie," reports a whole wsw. to nw. gale from the 29th to 31st; lowest barometer, 29.22 (742.2), at 6 a. m. of the 30th, in N. 50° 15′, W. 24° 30′. Capt. G. Stenger, of the s. s. "Leerdam," reports a whole wsw. to wnw. gale on the 29th and 30th; lowest barometer, 29.50 (749.3), at 10 a. m. of the 29th, in N. 48° 05′, W. 36° 03′. Capt. H. Christoffers, of the s. s. "Aller," reports a whole sw. to wnw. gale from the 28th to 30th; lowest barometer, 29.33 (745.0), at 4 p. m. of the 29th, in N. 49° 13′, W. 35° 29′. Capt. W. Skjodt, of the s. s. "Island," reports a whole gale on the 28th and 29th; wind veered from s. to nw.; lowest barometer, 29.09 (738.9), at 7 a. m. of the 28th, in N. 52° 06′, W. 41° 20′.

9.—This depression was central on the 19th over the Gulf of Saint Lawrence, and by the 20th had moved eastward to N. 51°, W. 49°, with a fair display of energy; by the 21st the storm-centre had advanced to N. 52°, W. 32°, with moderate to fresh gales over a considerable area; by the 22d the centre of depression had passed northeast to about N. 58°, W. 25°, in which position barometric pressure ranging below 29.00 (736.6) was indicated; by the 23d the storm had disappeared to the northward of the region of observation.

OCEAN ICE.

On chart i are also exhibited the limits within which icebergs and field ice were reported during August, 1887. These limits are determined from reports furnished by shipmasters, and from data collected by the Signal Service agencies.

The easternmost ice was passed on the 5th, in N. 48° 0′, W. 40° 0′, by the bark "Bessie Parker," and the southernmost ice reported was observed on the 11th, in N. 42° 21′, W. 49° 51′, from the s. s. "Sidonian."

Ice was most frequently observed during the month on the southeastern edge of the Banks of Newfoundland. Many large bergs were passed in Belle Isle Straits during the 5th and 6th, after which no ice was reported in that locality. On the 4th, 5th, and 25th, only, icebergs were reported in the vicinity of Cape Race.

As compared with ice reported during July, 1887, there is a marked decrease in the aggregate quantity of ice reported about Belle Isle Straits, while the accumulation of ice on the southeast edge of the Banks of Newfoundland is a distinctive feature of August, 1887, and the southern limit is over one degree farther south than the position in which isolated bergs were reported for July. The extreme eastern limit of ice is about one degree farther east than in July.

The quantity of ice reported during August, 1887, greatly exceeded that of the corresponding month of the preceding year, when the ice-area was confined to the locality of Belle Isle Straits and to isolated positions north of the forty-eighth parallel.

The following table shows the southern and eastern limits of the region within which ice was reported for August during the last six years:

Southern limit.			Eastern limit.		
Month.	Lat. N.	Lon. W.	Month.	Lat. N.	Lon. W.
	° ′	° ′		° ′	° ′
August, 1882	46 50	46 00	August, 1882	46 50	46 00
August, 1883	43 26	51 41	August, 1883	48 00	44 00
August, 1884	43 24	48 44	August, 1884	47 50	43 50
August, 1885	43 48	52 04	August, 1885	48 03	42 45
August, 1886	48 35	48 46	August, 1886	50 00	48 00
August, 1887	42 21	49 51	August, 1887	48 00	40 00

Icebergs and field ice were reported as follows:

Date.	Vessels.	Position. Lat. N.	Position. Lon. W.	Remarks.
		° ′	° ′	
4	Ycht. Dauntless	43 22	53 10	One berg.
	Bk. Charles Luling	43 37	48 56	One large berg.
	S. S. Monte Rosa	30 miles off C. Race.		One large berg.
5	S. S. Ems	45 26	49 17	One moderate sized berg.
	S. S. Grecian	53 30	50 00	One very large berg.
	S. S. Monte Rosa	30 miles northeast Cape Race.		Several large bergs.
	S. S. Lake Nipigon	Off Merdof Island, Straits of Belle Isle.		Many large bergs.
	Bk. Bessie Parker	48 00	40 00	Several medium sized bergs.
6	S. S. Harbinger	43 21	49 46	Two large bergs
	S. S. Grecian	Belle Isle to Cape Norman.		Three very large bergs.
7	S. S. Worcester	48 10	49 30	[ward. One immense berg to the south-
	S. S. Polynesia	43 20	49 40	One berg. [bergs.
	Bk. Sarah Chambers	43 00	49 30	One very large and seven small
9	Bk. Toivo	42 30	52 00	One very large berg.
		43 15	49 40	One large berg.
10	S. S. Milanese	43 15	49 19	One large berg.
11	S. S. Sidonian	42 21	49 51	One large berg.
12	S. S. Santiago	42 40	49 40	One large berg.
13	S. S. Westernland	42 34	49 52	One large and two small bergs.
14	S. S. Columbia	42 56	50 08	Collided with large berg.
		42 41	50 24	One small berg.
	S. S. Stranton	43 12	49 57	One very large berg.
16	S. S. Trave	47 25	47 16	One small berg.
	Bgt. D. H. Waetjen	42 59	50 02	One large berg.
17	S. S. Anchoria	47 44	46 37	One small berg.
		47 43	46 42	One large berg.
19	S. S. Wyoming	47 08	47 25	One small berg and pieces of ice.
	Sp. Charles S. Whitney	43 03	50 10	
21	S. S. British King	42 52	50 16	One berg.
23	S. S. Saale	46 04	47 23	One large berg.
	S. S. Catalonia	45 58	47 16	[ward. One berg.
24	S. S. Etruria	46 00	46 46	One large berg ten miles to north-
25	S. S. La Gascogne	Off Cape Race		One berg.
	S. S. Europa	46 00	47 01	
		45 55	47 22	
	S. S. Gleniffer	43 10	49 45	One berg.
		43 01	50 19	One very large berg.
30	S. S. Borderer	42 45	50 30	One berg and lumps of ice.

FOG.

On chart i the limits of fog-belts to the westward of the fortieth meridian are shown by dotted shading.

Fog was encountered over and near the Banks of Newfoundland on eighteen dates, and its reported southern limit was about two degrees farther north than in July. In the vicinity of Sable Island Bank fog was reported on three dates. Over and near Georges and Nantucket Shoals fog prevailed on eight dates.

A study of the meteorological conditions which attended the presence of fog in the vicinity of the Newfoundland Banks, shows that its development preceded and accompanied the passage of cyclonic areas from the American continent north of the fortieth parallel. Of the eighteen dates for which fog was reported in that region, areas of low barometric pressure were located as follows: on seven dates to the northward of the Banks or of Newfoundland; on five dates in the Valley or Gulf of Saint Lawrence; on five dates south of Nova Scotia or Newfoundland; and on one date to the eastward of the Banks. It therefore appears that its denser development in the Newfoundland fog-belt was due to a shift of wind to southerly in

advance of centres of cyclonic areas, and its disappearance was shown to follow a shift of wind to the northwest quadrant, following the passage of low barometer areas.

On the three dates for which fog was reported near Sable Island Bank, areas of low pressure appeared to the southward or southwestward of Nova Scotia on two dates, and to the northward of the Newfoundland Banks on one date.

Of the eight dates for which fog was reported over or near Georges and Nantucket Shoals, the presence of low barometer areas to the northward or eastward, west of the fortieth meridian, was shown on six dates; on one date a storm was central off Hatteras, and on one date the fog was reported in close proximity and to the westward of a cyclonic centre. As regards fog reported in the last-named localities, it would appear that its development accompanied a shift of wind to northerly, following the passage of centres of low barometer areas.

The fog reports for August furnish additional proof of the fact that the denser fog formations over the north Atlantic Ocean, west of the fortieth meridian, are intimately connected with, and dependent upon, the circulation of wind in cyclonic areas.

The following are the limits of fog-areas on the north Atlantic Ocean during August, 1887, as reported by shipmasters:

Limits of fog areas—Continued.

Date.	Vessel.	Entered.			Cleared.		
		Lat. N.	Lon. W.	Time.	Lat. N.	Lon. W.	Time.
		° ′	° ′		° ′	° ′	
1	S. S. Main	46 22	46 52	1.30 a. m...	44 46	51 40	6 p. m., at
1	S. S. Hekla	45 00	47 00	.....	43 09	55 00	[intervals.
1	S. S. Edam	48 40	44 00	.....	46 30	50 00	
1	S. S. Pennland	43 24	44 50	.....	43 34	44 24	
2	S. S. Devonia	42 40	60 03	.....	43 35	56 47	
2	S. S. California	42 54	58 49	.....	42 27	61 15	
2–3	S. S. LaChampagne	42 31	54 39	.....	44 48	45 31	
2–3	S. S. Rugia	46 11	44 24	.....	44 39	52 10	
3	S. S. Vaderland	43 43	45 20	.....	43 50	45 10	
4	S. S. Buffalo	42 35	65 50	.....	42 33	66 30	
5–6	S. S. Sarnia	53 51	49 51	.....	51 40	56 10	
6–7	S. S. Servia	40 53	68 39	.....	40 34	70 12	
7	S. S. Circassia	40 53	67 42	.....	40 43	68 43	
7	S. S. Scandinavian	43 25	59 53	.....	43 34	60 08	
7	S. S. Denmark	45 53	49 37	.....	45 49	50 06	
8	do	44 49	53 13	.....	44 38	53 45	
8	S. S. Schiedam	46 18	48 50	.....	44 34	53 45	
8–9	Bk. Toivo	43 52	49 10	.....	43 49	49 19	
11	do	43 40	51 44	.....	43 36	52 07	
12	S. S. Taormina	46 33	43 17	.....	45 02	48 55	
12–13	St. John's, N. F., dense fo g at sea.						
13	S. S. Westernland	42 52	47 38	.....	42 44	48 24	
13	S. S. Taormina	44 21	51 13	.....	49 09	51 56	
13–14	S. S. Britannic	44 45	49 30	.....	46 37	43 09	
13–14	S. S. Rotterdam	47 06	44 34	.....	45 36	50 47	
13–15	S. S. France	44 34	49 40	.....	46 25	38 28	
13–15	S. S. Baltimore	44 12	52 10	2 a. m.....	48 15	41 00	4 a. m.
14	S. S. Geiser	48 36	48 06	.....	48 02	49 52	
14	S. S. DeRuyter	45 21	46 46	.....	44 30	49 01	
14	S. S. Scythia	47 00	43 09	.....	46 06	46 34	
17	S. S. Rotterdam	41 14	67 30	.....	South of Nantucket shoals.		
17	S. S. LaChampagne	48 04	35 36	.....	47 55	36 23	
17	S. S. Spain	48 06	43 39	.....	47 32	45 26	
18	S. S. Geiser	41 18	67 39	.....	40 56	68 18	
18	S. S. DeRuyter	41 39	66 17	.....	41 16	67 31	[vals.
18	S. S. City of Richmond	41 22	65 40	.....	41 05	67 20	At inter-
19–20	S. S. Bohemia	41 40	65 42	8 p. m.....	40 44	69 29	3.20 a. m., at intervals
19–20	S. S. Wyoming	47 17	46 46	10 a. m.....	47 03	47 37	10 p. m.
20	S. S. LaChampagne	41 12	66 13	.....	40 25	69 26	At inter-
20	S. S. Belgenland	46 26	47 24	.....	45 08	52 30	[vals.
21	S. S. Galileo	43 57	45 30	.....	42 21	50 20	At inter-
21	St. John's, N. F., dense fo g at sea.						[vals.
23–24	S. S. Rhaetia	45 45	49 13	.....	45 20	50 30	
23	St. John's, N. F., dense fo g at sea.						
25	S. S. Galileo	42 26	66 41	.....	42 26	67 36	
25	St. John's, N. F., dense fo g at sea.						
25	S. S. British Princess	43 56	57 30	.....	43 31	58 32	
26	S. S. Devonia	44 43	53 14	.....	44 07	54 55	
26	S. S. Europa	44 54	51 38	.....	44 27	53 41	
30	S. S. Waesland	46 11	48 04	.....	45 43	49 23	
30	S. S. Britannic	46 44	46 25	.....	46 14	47 42	
31	S. S. Island	46 02	49 36	.....	45 34	50 55	

TEMPERATURE OF THE AIR (expressed in degrees, Fahrenheit).

The distribution of mean temperature over the United States and Canada for August, 1887, is exhibited on chart ii by the dotted isothermal lines. In the table of miscellaneous data are given the monthly mean temperatures, with the departures from the normal, for the various stations of the Signal Service; the figures opposite the names of the geographical districts in the columns for mean temperature, precipitation, and departures from the normal, show respectively the averages for the several districts. The normal for any district may be found by adding the departure to the current mean for the district when the departure is below the normal, and subtracting when above. On chart iii (formerly chart iv) the departures from the normal are illustrated by lines connecting stations of normal or equal abnormal values.

With respect to temperature, the month of August has not been marked by unusual conditions, the monthly means generally being normal, or differing but slightly therefrom, in nearly all parts of the United States. Along the immediate coasts of New England and the middle Atlantic States, in the Ohio and central Mississippi valleys, southern plateau, southern slope, and portions of Oregon and Washington Territory, the month has been slightly warmer than the average, while in all other portions of the country the temperature was normal or below. The region over which the most marked departures from normal temperature occur extends from Idaho eastward to Minnesota, where the monthly means are from 2° to 4° below the average.

The following are some of the most marked departures from the normal temperature at Signal Service stations, where the records cover ten or more years of observation:

Above normal.	°	Below normal.	°
Fort Davis, Tex	2.6	Yankton, Dak	3.1
Louisville, Ky	2.3	Saint Paul, Minn	3.0
Saint Louis, Mo	2.2	San Diego, Cal	2.8
Nashville, Tenn	1.5	Mount Washington, N. H	2.7
Knoxville, Tenn	1.0	Bismarck, Dak	2.4
Dodge City, Kans	0.8	Saint Vincent, Minn	2.3
Cincinnati, Ohio	0.7	La Crosse, Wis	2.3

RANGES OF TEMPERATURE.

The monthly, and the greatest and least daily, ranges of temperature, at Signal Service stations are given in the table of miscellaneous meteorological data.

The monthly ranges are greatest, and exceed 50°, in the upper Mississippi and Missouri valleys, and in portions of the northern slope and northern and middle plateau districts; they are least along the Gulf and Pacific coasts, where they vary from 15° to 30°.

The following are some of the greatest and least monthly ranges at Signal Service stations:

Greatest.	°	Least.	°
Winnemucca, Nev	67.3	Key West, Fla	14.2
Fort Yates, Dak	61.2	Corpus Christi, Tex	18.1
Fort Klamath, Oregon	60.0	Jacksonville, Fla	19.4
Saint Vincent, Minn	58.7	Galveston, Tex	19.9
Valentine, Nebr	58.2	Brownsville, Tex	21.3
Boisé City, Idaho	58.1	Cedar Keys, Fla	21.7
Dubuque, Iowa	55.3	Tatoosh Island, Wash	22.1
Yankton, Dak	55.0	San Diego, Cal	23.2

The greatest daily ranges of temperature vary from less than 20° at stations along the Gulf coast to more than 40° over the northern Rocky Mountain districts.

Throughout the country the least daily ranges of temperature vary from 1° at Key West, Fla., on the 14th, to 22° at Sacramento, Cal., on the 25th; in nearly all districts east of the Rocky Mountains they vary from 4° to 9°.

DEVIATIONS FROM NORMAL TEMPERATURES.

The following table shows for certain stations, as reported by voluntary observers, (1) the normal temperatures for a series of years; (2) the length of record during which the observations have been taken, and from which the normal has been computed; (3) the mean temperature for August, 1887; (4) the departures of the current month from the normal; (5) and the extreme monthly means for August during the period of observations and the year of occurrence:

State and station.	County.	(1) Normal for the month of August.	(2) Length of record.	(3) Total for August, 1887.	(4) Departure from normal.	(5) Extreme monthly mean temperature for August.			
						Highest.		Lowest.	
						Am't.	Year.	Am't.	Year.
Arkansas.		°	*Years.*	°	°	°		°	
Lead Hill	Boone	77.5	5	78.3	+0.8	.....	.....	.....	.....
California.									
Sacramento	Sacramento	70.8	21	66.2	−4.6	75.0	1875	66.2	1887
Fall Brook	San Diego	69.7	12	67.1	−2.6	72.9	1886	66.6	1879
Connecticut.									
Middletown*	Middlesex	68.7	29	66.8	−1.9	.....	.....	.....	.....
New Haven*	New Haven	70.2	101	67.8	−2.4	.....	.....	.....	.....
Thompson*	Windham	67.5	30	65.4	−2.1	.....	.....	.....	.....
Waterbury*	New Haven	69.7	12	66.8	−2.9	.....	.....	.....	.....
Illinois.									
Collinsville	Madison	73.9	7	76.0	+2.1	.....	.....	.....	.....
Mattoon	Coles	75 9	7	74.0	−1.9	81.0	1881	72.0	1884
Peoria	Peoria	75.4	32	70.7	+1.3	.....	.....	.....	.....
Riley	McHenry	68.5	26	68.1	−0.4	.....	.....	.....	.....
Sycamore	De Kalb	69.0	7	68.8	−0.2	.....	.....	.....	.....
Indiana.									
Blue Lick	Clark	7513	10	77.2	+1.9	.....	.....	.....	.....
Connersville	Fayette	70.8	6	73.5	+2.7	.....	.....	.....	.....
Lafayette	Tippecanoe	72.5	8	72.2	−0.3	.....	.....	.....	.....
Logansport	Cass	73.7	33	73.3	−0.4	78.7	1881	66.6	1866
Sunman	Ripley	73.6	5	71.9	+1.3	.....	.....	.....	.....
Vevay	Switzerland	75.9	21	76.2	+0.3	.....	.....	.....	.....
Worthington	Greene	71.7	6	74.1	+2.4	.....	.....	.....	.....
Iowa.									
Monticello	Jones	70.2	34	69.8	−0.4	77.1	1861	64.3	1863
Kansas.									
Independence	Montgomery	78.3	16	77.6	−0.7	85.7	1874	72.8	1884
Lawrence	Douglas	75.6	20	73.6	−2.0	.....	.....	.....	.....
Yates Centre	Woodson	75.6	7	73.6	−2.0	.....	.....	.....	.....
Maine.									
Belfast*	Waldo	65.2	28	62.7	−2.5	.....	.....	.....	.....
Cornish	York	68.5	30	64.0	−4.5	73.9	1876	62.4	1866
Gardiner*	Kennebec	66.6	51	63.2	−3.4	.....	.....	.....	.....
Orono*	Penobscot	65.7	19	63.4	−2.3	.....	.....	.....	.....
Maryland.									
Cumberland	Alleghany	71.2	16	70.2	−1.0	76.0	1872–'73	68.5	1883
Fallston	Harford	71.6	15	70.0	−1.6	75.9	1872	68.3	1883
New Midway	Frederick	75.3	5	71.9	−3.4	.....	.....	.....	.....
Massachusetts.									
Amherst*	Hampshire	68.3	50	66.8	−1.5	.....	.....	.....	.....
Cambridge*	Middlesex	69.6	65	66.7	−2.9	.....	.....	.....	.....
Fitchburg*	Worcester	67.8	31	64.7	−3.1	.....	.....	.....	.....
New Bedford*	Bristol	68.3	75	66.5	−1.8	.....	.....	.....	.....
Somerset	Bristol	72.0	17	70.2	−1.8	.....	.....	.....	.....
Springfield*	Hampden	70.5	20	68.3	−2.2	.....	.....	.....	.....
Taunton*	Bristol	72.4	16	68.8	−3.6	.....	.....	.....	.....
Nevada.									
Carson City	Ormsby	69.0	8	67.2	−1.8	.....	.....	.....	.....
New Brunswick.									
Saint Johns*	Saint Johns	60.2	27	61.2	+1.0	.....	.....	.....	.....
New Hampshire.									
Concord*	Merrimac	68.5	19	64.5	−4.0	.....	.....	.....	.....
Hanover*	Grafton	67.5	18	63.0	−4.5	.....	.....	.....	.....
New Jersey.									
Dover	Morris	68.8	5	64.9	−3.9	.....	.....	.....	.....
New York.									
Factoryville	Tioga	65.9	6	65.5	−0.4	.....	.....	.....	.....
Palermo	Oswego	67.1	34	63.5	−3.6	71.6	1877	61.0	1885
Ohio.									
Wauseon	Fulton	69.6	17	68.8	−0.8	72.8	1872	63.0	1871
Pennsylvania.									
Dyberry	Wayne	65.2	20	64.5	−0.7	.....	.....	.....	.....
South Carolina.									
Stateburg	Sumter	77.4	7	75.6	−1.8	79.7	1881	75.6	1887
Texas.									
New Ulm	Austin	82.6	16	83.4	+0.8	84.4	1873	79.4	1882
Vermont.									
Lunenburg*	Essex	65.4	38	63.1	−2.3	.....	.....	.....	.....
Newport*	Orleans	66.9	13	64.3	−2.6	.....	.....	.....	.....
Strafford	Orange	67.7	13	65.7	−2.0	.....	.....	.....	.....
Virginia.									
Bird's Nest	Northampton	77.1	19	76.1	−1.0	.....	.....	.....	.....
Dale Enterprise	Rockingham	75.1	7	76.2	+1.1	.....	.....	.....	.....
Variety Mills	Nelson	73.0	10	71.0	−2.0	76.1	1881	70.8	1883
Wytheville	Wythe	70.4	22	68.8	−1.6	.....	.....	.....	.....
West Virginia.									
Helvetia	Randolph	67.0	10	66.8	−0.2	.....	.....	.....	.....

* From the "Bulletin of the New England Meteorological Society."

The following notes are furnished by voluntary observers:

Illinois.—Riley, McHenry Co.: the mean temperature for the summer of 1887, 71°, is 2° above the average of the last twenty-six years; during this period only the summer of 1874 was warmer, and that of 1870 had a corresponding average.

Kansas.—Independence, Douglas Co.: the mean temperature for the summer of 1887 is 1° above the normal, as deduced from observations of the sixteen preceding years.

Yates Centre, Woodson Co.: the mean temperature for the summer months, 75°, is but a fraction of a degree below the normal of the past seven summers.

New Jersey.—South Orange, Essex Co.: the mean temperature for the summer of 1887, 70°, is 1° above the normal of the last seventeen summers.

New York.—Palermo, Oswego Co.: the mean temperature for the summer of 1887, 66°, is 1° above the normal of the last thirty-four summers; the highest summer mean in that time, 71°, occurred in 1870; the lowest, 62°, in 1886.

Ohio.—Wauseon, Fulton Co.: the temperature for the summer months (June, July, and August), 1887, 72°, is 2° above the average of the last seventeen years.

Texas.—New Ulm, Austin Co.: the mean temperature for the summer months (June, July, and August), 1887, 82°, is the same as the normal of the last sixteen summers.

Table of comparative maximum and minimum temperatures for August.

State or Territory.	Station.	For 1887.		Since establishment of station.				Length of record.
		Max.	Min.	Max.	Year.	Min.	Year.	
		°	°	°		°		*Years*
Alabama	Mobile	93.0	65.2	100.0	1874	63.0	1884	16
Do	Montgomery	90.5	59.1	103.0	1874	61.5	1879	14
Arizona	Prescott	93.0	49.8	99.0	1878	36.0	1876	11
Do	Fort Apache	98.0	50.1	98.1	1885	41.0	1880	8
Arkansas	Fort Smith	108.0	57.1	104.5	1886	57.1	1886	5
Do	Little Rock	99.0	59.2	102.0	1881	59.2	1884	8
California	San Francisco	72.8	48.7	89.0	1879	48.4	1886	16
Do	San Diego	77.2	54.0	91.5	1884	54.0	1879, 1884	15
Colorado	Denver	94.6	46.9	105.0	1878	44.0	1876	15
Do	Pike's Peak	55.7	32.1	62.0	1878	15.0	1882	13
Connecticut	New Haven	86.5	49.7	90.0	1873, 1876, 1881, 1884	45.1	1885	14
Do	New London	83.5	52.3	90.0	1873	47.5	1884	15
Dakota	Fort Buford	92.4	44.4	107.0	1882	34.5	1886	8
Do	Yankton	98.7	43.7	103.0	1873	40.7	1886	14
Dist. of Columbia	Washington City	91.7	51.0	101.0	1881	50.0	1874	16
Florida	Jacksonville	97.1	67.7	100.0	1874	64.9	1886	15
Do	Key West	89.3	75.1	100.0	1886	72.0	1882, 1884	16
Georgia	Atlanta	91.2	54.6	96.2	1881	57.0	1879	8
Do	Savannah	97.5	65.0	100.0	1878	63.0	1879	16
Idaho	Boisé City	97.3	39.2	105.0	1883	39.0	1881	10
Illinois	Cairo	97.2	57.8	103.0	1881	54.5	1885	15
Do	Chicago	97.7	49.1	98.0	1874	51.1	1884	15
Indiana	Indianapolis	99.0	49.2	101.0	1881	47.7	1885	14
Indian Ter.	Fort Sill	103.5	55.5	105.0	1881	53.0	1880	9
Iowa	Dubuque	99.1	43.8	97.4	1886	41.0	1875	14
Do	Des Moines	100.9	45.6	103.0	1881	46.0	1885, 1886	9
Kansas	Dodge City	101.8	51.0	101.6	1881	50.0	1880	12
Do	Leavenworth	99.7	48.0	107.0	1874	50.0	1884	16
Kentucky	Louisville	99.1	55.1	104.6	1881	52.4	1885	14
Louisiana	New Orleans	94.3	71.0	96.5	1877	65.5	1884	16
Do	Shreveport	101.5	65.6	105.0	1881	58.0	1880	14
Maine	Eastport	78.2	49.0	88.0	1880	45.0	1880	14
Do	Portland	85.8	47.5	95.0	1876	47.5	1885	15
Maryland	Baltimore	91.0	55.2	98.0	1881	52.0	1874	15
Massachusetts	Boston	86.3	52.2	96.8	1881	47.0	1880	16
Michigan	Marquette	88.6	40.9	97.7	1886	33.0	1885	13
Do	Grand Haven	90.9	46.1	92.0	1881	42.5	1875	14
Minnesota	Saint Vincent	88.0	29.3	103.2	1886	27.4	1885	7
Do	Saint Paul	93.5	41.1	98.0	1880	42.1	1886	14
Mississippi	Vicksburg	95.4	64.1	100.0	1878	61.8	1885	14
Missouri	Saint Louis	99.0	52.1	106.4	1881	53.5	1885	16
Montana	Fort Assinaboine	89.0	42.4	98.0	1882	37.0	1881	7
Do	Helena	87.1	40.2	95.1	1886	34.0	1880	7
Nebraska	North Platte	99.8	46.8	103.0	1878	42.0	1876	12
Do	Omaha	101.5	48.2	105.0	1874	46.3	1886	14
Nevada	Winnemucca	93.3	26.0	102.5	1882	32.0	1880	8
New Hampshire	Mt. Washington	63.8	26.4	74.0	1872	20.0	1876	15
New Jersey	Atlantic City	88.3	53.7	91.8	1881	48.8	1885	13
New Mexico	Santa Fé	86.5	45.5	97.0	1878	40.0	1882	13
New York	Buffalo	94.2	49.6	90.8	1881	44.0	1880	14
Do	New York City	88.1	54.9	96.0	1881	51.0	1885	16
North Carolina	Charlotte	95.1	52.8	100.5	1881	55.8	1885	8
Do	Wilmington	95.0	55.6	99.0	1878	50.0	1874	16
Ohio	Cincinnati	99.6	53.6	101.0	1881	50.9	1885	16
Do	Sandusky	97.1	49.7	98.0	1881	48.5	1882	10
Oregon	Portland	90.5	45.0	94.5	1885	43.0	1876	14
Do	Roseburg	89.0	45.1	97.2	1884	40.5	1882	10
Pennsylvania	Pittsburg	93.3	45.8	99.8	1881	47.4	1885	14
Do	Philadelphia	90.1	82.0	99.0	1881	51.1	1885	16
Rhode Island	Block Island	82.5	49.3	82.0	1882	52.9	1885	6
South Carolina	Charleston	97.9	66.7	97.1	1881	62.0	1879	14
Tennessee	Knoxville	94.1	53.9	100.0	1881	50.0	1879	16
Do	Memphis	97.5	58.6	102.0	1881	59.0	1880	14
Texas	Brownsville	92.7	71.4	101.0	1877, 1883	68.0	1884	11
Do	Fort Elliott	98.5	50.4	101.0	1881	48.0	1880, 1882	7
Utah	Salt Lake City	94.9	45.6	101.0	1875	44.0	1880	13
Virginia	Lynchburg	95.2	49.8	100.0	1881	50.0	1874	14
Do	Norfolk	91.8	59.5	99.0	1881	58.0	1874	16
Washington Ter.	Spokane Falls	97.3	43.3	101.5	1882	38.0	1881, 1882	6
Do	Olympia	84.8	40.1	92.2	1885	41.0	1880, 1882	10
Wisconsin	La Crosse	96.0	42.3	96.0	1874, 1881	43.8	1885	14
Do	Milwaukee	92.8	46.9	98.0	1874	42.0	1875	16
Wyoming	Cheyenne	91.8	44.8	96.1	1882	34.0	1870	14

FROSTS.

Frosts occurred during August as follows:

1st and 2d.—Philipsburg, Pa.

4th.—Humphrey, N. Y.

7th.—Mount Washington, N. H.

8th.—Hanover and Mount Washington, N. H.; Nyack, N. Y.; Fort Klamath, Oregon; Dyberry and Wellsborough, Pa.; Northfield, Vt.

12th.—Lunenburg, Vt.

13th.—Mount Washington, N. H.; Lunenburg, Vt.

14th.—Carson City, Nev.; Mount Washington, N. H.; Lunenburg, Vt.

17th.—Mount Washington, N. H.

18th.—Saint Vincent, Minn.; Fort Klamath, Oregon.

19th.—Cresco, Iowa; Alma and East Tawas, Mich.; Carson City, Nev.

20th.—Fort Klamath, Oregon.

21st.—Lebanon Springs, N. Y.

22d.—Fort Randall, Dak.

23d.—Fort Totten, Fort Randall, and Richardton, Dak.; Oskaloosa, Iowa; Rochester, Minn.

24th.—Bismarck, Fort Totten, Fort Yates, and Webster, Dak.; Oneida and Sycamore, Ill.; Bancroft, Cedar Rapids, Cresco, Dubuque, Independence, Monticello, and Muscatine, Iowa; Calumet, Central Mine, Harrisville, Marshall, Saranac, and Hudson, Mich.; Brainerd, Canby, Grand Meadow, Litchfield, Moorhead, Morris, Northfield, Pine River Dam, and Sherburne, Minn.

25th.—Alma, Central Mine, Agricultural College, East Tawas, Gaylord, Grand Rapids, Greenville, Hastings, Hudson, Harrisville, Newaygo, Lansing, Saint Johns, and Swartz Creek, Mich.; Delano, Grand Meadow, Litchfield, Moorhead, Park Rapids, Pokegama Falls Dam, and Princeton, Minn.; Wauseon, Ohio.

26th.—Baraga, Central Mine, Harrisville, and Hudson, Mich.; Brainerd, Minn.; Carson City, Nev.; Middlebrook, W. Va.

27th.—Pokegama Falls Dam, Minn.; Beverly, N. J.: Lebanon Springs, Ithaca, and Factoryville, N. Y.; Dyberry, Quakertown, and Wellsborough, Pa.

28th.—Baraga, Evart, Hart, Lansing, Mount Morris, Saint Johns, Swartz Creek, Thornville, and Valley Centre, Mich.; Concord, N. H.; New Comerstown, Sidney, and Wauseon, Ohio; Dyberry, Grampian Hills, and Wellsborough, Pa.; Northfield, Vt.

29th.—Swartz Creek and Valley Centre, Mich.; Mount Washington, N. H.; Lebanon Springs, N. Y.; Greenville, Hudson, New Comerstown, Napoleon, Sidney, Wauseon, and Weymouth, Ohio; Lakeview and Fort Klamath, Oregon; Grampian Hills and Wellsborough, Pa.; Northfield, Vt.

30th.—Mount Washington, N. H.; Swartz Creek, Valley Centre, and Wixom, Mich.; New Comerstown and Weymouth, Ohio; Lakeview and Fort Klamath, Oregon.

31st.—Wixom, Mich.; Mount Washington, N. H.; Dyberry, Pa.

The following reports of injury to vegetation by frost have been received:

Saint Vincent, Minn.: the first severe frost of this season occurred on the morning of the 24th; the damage done to wheat, oats, barley, and corn, was very light; all kinds of garden produce, however, were severely nipped; a heavy frost occurred also on the 25th.

Mr. A. T. Smith, of Altamahaw, Alamance Co., N. C., reports that the first frost of the season occurred on the 30th, slightly injuring tomatoes and tender vegetables.

Linkville, Oregon: very heavy frost occurred on the 30th and 31st, causing great injury to crops.

East Tawas, Mich.: a heavy frost occurred on the 19th, doing considerable damage to vines.

ICE.

Ice formed at Winnemucca, Nev., on the 31st; minimum temperature, 26°.

TEMPERATURE OF WATER.

The following table shows the maximum, minimum, and mean water temperature, as observed at the harbors of the several stations; the monthly range of water temperature; the average depth at which the observations were made, and the mean temperature of the air:

Temperature of water for August, 1887.

Station	Temperature at bottom.				Mean temperature of the air at station.	Average depth of water, feet and tenths.
	Max.	Min.	Range.	Monthly mean.		
	°	°	°	°	°	
Canby, Fort, Wash.	63.6	57.9	5.7	61.0	56.8	13.7
Cedar Keys, Fla.	90.3	79.5	10.8	83.1	82.5	8.2
Charleston, S. C.	86.0	77.5	8.5	80.2	83.6	36.8
Eastport, Me.	52.8	49.9	2.9	51.2	59.9	16.7
Galveston, Tex.	88.0	84.7	3.3	86.3	83.1	14.2
Key West, Fla.*	89.2	83.9	5.3	87.7	83.4	20.3
New London, Conn.	70.2	65.8	4.4	68.7	69.2	12.1
New York City	80.0	71.3	8.7	75.2	71.4	15.9
Pensacola, Fla.	87.7	77.2	10.5	83.9	81.6	18.3
Portland, Me.	65.8	59.5	9.2	59.6	64.8	17.8

* Record for thirty days.

PRECIPITATION (expressed in inches and hundredths).

The distribution of precipitation over the United States and Canada for August, 1887, as determined from the reports of about eight hundred stations, is exhibited on chart iv. In the table of miscellaneous meteorological data are given, for each Signal Service station, the total precipitation, with the departures from the normal. The figures opposite the names of the geographical districts in columns for mean temperature, precipitation, and departures from the normal, show respectively the averages for the several districts. The normal for any district may be found by adding the departure to the current mean when the precipitation is below the normal, and subtracting when above.

Except over an area extending from northern Georgia to central Virginia, and along the coast of Maine, the precipitation in all districts east of the Mississippi River is below the normal; it is also deficient in the states of Arkansas, Missouri, Iowa, Minnesota, in the Pacific coast states, and along the southwestern border from the lower Rio Grande valley to California, with the exception of southeastern Arizona, where reports from a few stations show an excess. The most marked deficiencies occur in Florida and the upper lake region, where the precipitation is but little more than half of the average.

In the northern plateau, northern and middle slopes, upper Missouri valley, west Gulf states, and, as stated above, over an area extending from northern Georgia to central Virginia, the monthly precipitation is in excess of the August average. In the upper Missouri valley and northern slope the excess amounts to more than one inch. The heaviest rains of the month fell in the northern and western portions of North Carolina and in southern Virginia. The Signal Service observer at Cape Henry, Va., reports a monthly rainfall exceeding sixteen inches, and the voluntary observer at Tarborough, Edgecombe Co., N. C., reports more than twenty-two inches.

DEVIATIONS FROM AVERAGE PRECIPITATION.

The following table shows for certain stations, as reported by voluntary observers, (1) the average precipitation for a series of years; (2) the length of record during which the observations have been taken, and from which the average has been computed; (3) the total precipitation for August, 1887;

(4) the departures of the current month from the average; (5) and the extreme monthly precipitation for August during the period of observations and the year of occurrence:

State and station.	County.	(1) Average for the month of August.	(2) Length of record.	(3) Total for August, 1887.	(4) Departure from average.	(5) Extreme monthly precipitation for August.			
						Greatest.		Least.	
						Am't.	Year.	Am't.	Year.
Arkansas.		*Inches*	*Years.*	*Inches*	*Inches.*	*Inches*		*Inches.*	
Lead Hill	Boone	4.80	5	8.23	+ 3.48				
California.									
Sacramento	Sacramento	0.00	21	trace.	+ trace.				
Fall Brook	San Diego	0.05	12	0.00	— 0.05	0.26	1880	0.00	(†)
Connecticut.									
Canton *	Hartford	5.11	26	5.85	+ 0.74				
Hartford*	Hartford	4.69	16	8.22	+ 3.53				
Middletown *	Middlesex	4.92	29	4.05	— 0.87				
Wallingford *	New Haven	5.19	29	4.77	— 0.42				
Illinois.									
Collinsville	Madison	2.25	4	0.84	— 1.41				
Mattoon	Coles	3.60	7	3.23	— 0.37	7.70	1885	0.87	1881
Peoria	Peoria	3.15	32	2.72	— 0.43				
Riley	McHenry	3.63	26	4.85	+ 1.22				
Sycamore	De Kalb	3.76	7	3.61	— 0.15				
Indiana.									
Logansport	Cass	3.34	33	3.25	— 0.09	9.14	1876	0.17	1861
Vevay	Switzerland	3.19	31	2.02	— 1.17				
Iowa.									
Cresco	Howard	2.89	14	2.23	— 0.66				
Monticello	Jones	4.00	34	3.31	— 0.69	8.54	1885	1.17	1856
Kansas.									
Independence	Montgomery	3.14	15	3.60	+ 0.46	7.46	1885	0.39	1874
Lawrence	Douglas	3.53	20	4.88	+ 1.35				
Yates Centre	Woodson	2.22	7	2.19	— 0.03				
Maine.									
Cornish	York	4.23	30	2.52	— 1.71				
Gardiner *	Kennebec	3.79	49	3.42	— 0.37				
Orono *	Penobscot	3.50	19	4.60	+ 1.10				
Maryland.									
Cumberland	Alleghany	2.83	16	1.12	— 1.71	8.09	1882	0.31	1881
Fallston	Harford	5.16	16	5.99	+ 0.83	11.55	1872	1.10	1881
New Midway	Frederick	5.92	6	2.74	— 3.18	15.00	1885	0.87	1886
Massachusetts.									
Amherst *	Hampshire	4.35	53	8.72	+ 4.37				
Cambridge *	Middlesex	4.60	46	3.73	— 0.93				
Chestnut Hill *	Middlesex	3.52	12	3.53	+ 0.01				
Framingham *	Middlesex	3.93	13	4.62	+ 0.70				
Lake Cochituate *	Middlesex	4.90	36	3.70	— 1.20				
Ludlow *	Hampden	3.87	12	7.30	+ 3.43				
Lynn *	Essex	3.78	13	5.84	+ 2.06				
Mystic Lake *	Middlesex	3.74	12	5.17	+ 1.43				
New Bedford *	Bristol	4.27	74	6.61	+ 2.34				
Springfield *	Hampden	4.57	40	7.69	+ 3.12				
Waltham *	Middlesex	4.43	63	4.64	+ 0.21				
Nevada.									
Carson City	Ormsby	0.10	8	trace.	— 0.10				
New Brunswick.									
Saint Johns *	Saint Johns	3.70	27	4.63	+ 0.93				
New Hampshire.									
Antrim	Hillsborough	3.07	15	8.83	+ 5.76				
Concord	Merrimac	4.09	32	7.68	+ 3.59				
Hanover *	Grafton	3.12	20	3.14	+ 0.02				
New Jersey.									
Dover	Morris	4.54	4	3.20	— 1.34				
South Orange	Essex	5.06	17	6.38	+ 1.32				
New York.									
Factoryville	Tioga	2.49	6	2.63	+ 0.14				
Palermo	Oswego	2.91	34	1.91	— 0.70	6.40	1864	0.50	1870
Ohio.									
Wauseon	Fulton	3.03	15	1.52	— 1.51	4.86	1886	1.12	1884
Pennsylvania.									
Dyberry	Wayne	3.44	16	5.03	+ 1.59				
South Carolina.									
Kirkwood	Kershaw	4.04	20	2.23	— 2.71				
Stateburg	Sumter	3.57	7	4.98	+ 1.41	5.74	1882	2.12	1886
Texas.									
New Ulm	Austin	3.04	16	1.72	— 1.32	8.38	1872	0.09	1885
Vermont.									
Lunenburg *	Essex	3.70	38	2.36	— 1.34				
Newport *	Orleans	3.81	13	2.94	— 0.87				
Strafford	Orange	3.55	13	5.00	+ 1.45				
Virginia.									
Bird's Nest	Northampton	4.20	19	8.20	+ 4.00	11.25	1875		
Dale Enterprise	Rockingham	4.00	7	2.87	— 1.13				
Variety Mills	Nelson	3.25	8	4.91	+ 1.66	7.29	1879	0.57	1881
Wytheville	Wythe	3.84	23	5.78	+ 1.94				
West Virginia.									
Helvetia	Randolph	4.41	10	3.96	— 0.45				

* From the "Bulletin of the New England Meteorological Society." † 1876, 1877, 1878, 1881, 1883, 1887.

The following notes are furnished by voluntary observers:

California.—Sacramento, Sacramento Co.: the only appreciable precipitation for August during the past twenty-one years occurred in 1884, when 0.01 inch fell.

Illinois.—Riley, McHenry Co.: the total precipitation for the summer of 1887, 8.78, is 2.78 below the average of the last twenty-six years.

Kansas.—Independence, Montgomery Co.: the total precipitation for the summer of 1887, 11.06, is 1.94 below the average of the last fifteen years.

Lawrence, Douglas Co.: the total precipitation for the eight months ending August 31st, 20.80, is 3.80 below the average for the same month during the last nineteen years.

New Jersey.—South Orange, Essex Co.: the total precipitation for the summer of 1887, 21.26, is 8.05 above the average of the last seventeen years.

Texas.—New Ulm, Austin Co.: the total precipitation for the three summer months, 6.72, is 1.35 below the average for the same months during the last sixteen years.

Virginia.—Wytheville, Wythe Co.: the total precipitation for the eight months ending August 31st, 31.27, is 1.54 above the normal for the same months during the period of twenty-three years.

Table of excessive and greatest monthly precipitation for August, 1887.

Station.	Specially heavy.		Largest monthly.	Station.	Specially heavy.		Largest monthly.
	Date.	Amt.	Amount.		Date.	Amt.	Amount.
Alabama.				*Maine*—Con.			
Opelika	4	2.80	6.53	Portland	24, 25	2.23	6.56
Eufaula	1, 2	2.60		Orono	11, 12	2.00	
Scottsborough	5, 6	3.25		*Maryland.*			
Mobile	9	2.20		Fort McHenry	22	2.25	
Arizona.				Fallston	21, 22	2.23	
Fort Grant			6.20	*Massachusetts.*			
Arkansas.				Wood's Holl	2	6.92	10.84
Lead Hill			8.28	Vineyard Haven	2	4.70	8.90
Pine Bluff	5, 6	2.10		Amherst *a*	23, 24	3.47	8.72
Connecticut.				Amherst *b*	18	3.26	7.75
Hartford *a*			8.23	Do	24	2.35	
Hartford *b*	18	3.17	7.93	Springfield			7.69
Do	24	2.63		Ludlow			7.30
Dakota.				Williamstown	22 to 24	3.91	7.03
Parkston	2, 3	2.50	10.84	New Bedford	2	2.60	6.61
Do	29	3.60		Do	25	3.16	
Fort Sisseton	6	6.00	8.07	Deerfield	2, 3	2.10	6.54
Huron			6.13	Do	22	2.05	
Florida.				North Truro	24, 25	2.64	6.38
Limona	25	2.10	11.17	Milton	24	2.35	
Do	27, 28	5.60		Westborough	23, 24	2.00	
Archer	1, 2	2.37	8.37	Taunton	22 to 24	3.52	
Do	4, 5	2.10		Edgartown	2, 3	2.44	
Ft. St. Augustine	28	4.70	7.25	*Michigan.*			
Alva	29	2.25	6.66	Big Rapids	22	2.64	
Mantaee			6.18	Alma	22	2.34	
Georgiana			6.06	*Minnesota.*			
Live Oak	1, 2	2.10		Delano			7.00
Georgia.				Red Wing			6.70
Toccoa	1, 2	8.59	15.26	Excelsior			6.10
Do	8	3.92		Fort Snelling	13	2.90	
Gainesville	1, 2	5.73	13.16	*Mississippi.*			
Do	18	2.00		Edwards	6, 7	3.67	7.83
Way Cross	4, 5	4.05	8.70	Okolona	6, 7	2.00	
Do	19	2.50		Natchez	6, 7	2.04	
Eastman	1, 2	2.00	8.54	Do	18	2.52	
Do	4, 5	4.03		*Montana.*			
Do	21	2.00		Poplar River	12, 13	2.58	
Athens *a*	1 to 3	4.80	7.84	Fort Maginnis	30, 31	2.96	
Athens *b*	1, 2	4.70	7.71	*Nebraska.*			
Augusta	8, 9	2.26	6.83	Crete	29, 30	2.25	
Quitman	1, 2	3.25	6.75	Tecumseh	20, 21	2.85	
Griffin	1	2.23		Brownville	20	2.25	
Newnan	7, 8	2.18		*New Hampshire.*			
Milledgeville	19	2.32		Antrim	18	3.27	8.83
Forsyth	2	2.20		Do	24, 25	2.96	
Fort Gaines	1, 2	2.81		Concord *a*	18	2.18	7.78
Millen	7, 8	2.75		Do	22, 23	2.16	
Smithville	1, 2	2.00		Concord *b*			7.68
Atlanta	17, 18	2.37		Manchester			6.33
Illinois.				Belmont	25	2.81	6.22
Cedarville	10	3.00	6.04	Lake Village	22 to 24	2.14	
Do	21, 22	2.14		Wolfeborough	23 to 25	2.30	
Belvidere	23	3.00	6.01	Nashua	22, 23	2.07	
Geneseo	11	3.07		*New Jersey.*			
Hennepin	11	2.70		New Brunswick *a*	2	4.62	7.34
Pana	11	3.75		South Orange	22	4.00	6.38
Richview	16	3.72		New Brunswick *b*	2	3.67	6.24
Fairview	17	2.00		Tenafly	22	2.12	
Lanark	10	2.06		Roseland	23	2.16	
Rockford	11	2.00		*New York.*			
Indiana.				Boyd's Corners			6.85
Fortville			6.83	Menands	22 to 24	2.28	
Iowa.				Setauket	22	2.26	
Logan	20	2.30		*North Carolina.*			
Fort Madison	12	2.10		Asheville	3 to 5	3.05	28.65
Kansas.				Do	11 to 16	6.30	
East Norway	20	5.10	8.42	Do	24 to 29	6.90	
Brookville			8.05	Tarborough	1 to 7	13.03	22.73
Carneiro	4, 5	2.03	7.17	Do	19	3.49	
Leavenworth	4	2.32	7.11	Do	27, 28	3.09	
Wakefield	3 to 5	3.02	6.89	Salisbury	1, 2	4.30	16.14
Salina	13, 14	2.00	6.60	Do	18, 19	2.47	
Manhattan	4, 5	3.08	6.58	Do	27	3.67	
Morse	15, 16	3.25	6.50	Goldsborough	7, 8	2.21	14.36
Wilson			6.47	Do	15, 16	3.90	
Bunker Hill	4	2.40	6.30	Do	27	4.00	
Belleville			6.19	Marion	1, 2	5.23	14.18
Fort Hays	25	2.00		Do	18	2.45	
Fort Riley	3, 4	2.00		Southport	4	4.80	12.53
Elk Falls	15, 16	2.15		Statesville	2	6.51	12.25
Montero	11	2.30		Kitty Hawk	3	4.27	12.04
Gorham	4, 5	2.00		Do	20	2.15	
Russell	4, 5	3.50		New-Berne	3, 4	2.84	11.88
Lawrence	4, 5	2.50		Do	27, 28	2.53	
Topeka	4, 5	2.22		Wash Woods*	15, 16	3.09	11.87
Louisiana.				Lincolnton	1	4.66	11.11
New Orleans	5	2.06	7.42	Raleigh *a*	27	4.16	10.80
Liberty Hill	25	2.00		Reidsville	2, 3	3.95	10.36
Coushatta	7, 8	2.36		Do	16	2.15	
Maine.				Do	20	2.24	
Bar Harbor	25	2.73	6.61	Mount Pleasant	27	4.47	10.2

Table of excessive and greatest monthly precipitation for August—Cont'd.

Station.	Specially heavy.		Largest monthly.
	Date.	Amt.	Amount.
N. Carolina—Con.			
Wilmington	3, 4	6.61	9.88
Monroe	2	2.44	9.42
Do	26, 27	3.55	
Raleigh *b*	27	4.05	9.38
Lumberton	27	2.90	9.11
Charlotte	26, 27	3.07	9.02
Raleigh *c*			8.85
Hatteras	20	2.50	7.99
Weldon *a*	1, 2	2.60	
Weldon *b*	2	2.61	
Lenoir	2	2.30	
Ohio.			
West Milton	11	2.00	
South Carolina.			
Brewer Mines	19	4.05	13.70
Greenville	1, 2	4.61	12.12
Do	7, 8	2.98	
Chester	1 to 3	3.36	11.93
Do	7, 8	2.08	
Do	19, 20	3.06	
Do	27	2.90	
Evergreen	7, 8	8.32	10.78
Anderson *a*	8	2.22	10.47
Cheraw	7, 8	3.23	10.20
Do	19, 20	2.14	
Do	27	2.25	
Spartanburg	1, 2	2.85	9.11
Do	8	3.30	
Anderson *b*	7, 8	3.93	8.96
Batesburg	6, 7	2.25	8.39
Spartanburg *a*	1, 2	2.54	7.84
Do	8	2.04	
Do	27	2.38	
Winnsborough			7.68
Bennettsville	27	2.60	7.20
Columbia	18 to 20	2.39	7.12
Greenwood	19, 20	2.15	7.05
Newberry			6.86
Saint Matthew's	18	2.05	6.78
S. Carolina—Con.			
Abbeville			6.50
Jacksonborough			6.01
Stateburg	7	2.04	
Tennessee.			
Rogersville	17, 18	2.46	6.43
Milan *a*	15 to 17	5.17	6.36
Milan *b*	15 to 17	5.10	6.28
Knoxville	6	2.46	
Texas.			
Cleburne			16.30
Tyler	17, 18	2.03	9.36
Do	25, 26	3.73	
Do	30	3.00	
Houston	23	2.44	8.57
Do	30	3.40	
Corsicana			8.17
Dallas	29 to 31	6.47	7.98
Waco	30	4.50	6.80
Galveston	30, 31	2.65	6.43
Palestine	30	2.42	
Hearne	23	2.46	
Vermont.			
Brattleborough	18	2.93	7.63
Lunenburg	23 to 25	2.60	
Virginia.			
Cape Henry	1 to 7	7.81	16.82
Do	18, 19	3.80	
Do	23	2.00	
Norfolk	2, 3	2.31	8.56
Bird's Nest	3	2.50	8.20
Fort Monroe	6	2.00	7.86
Wytheville	13, 14	2.06	
Wisconsin.			
Madison	10, 11	2.97	
Beloit	22	2.17	
Fond du Lac	9, 10	3.74	
Prairie du Chien	10	2.34	
Lancaster	10	2.50	

[a] Record for 20 days.

SLEET.

The observer at Pike's Peak, Colo., reports sleet on the 20th.

SNOW.

Fort Bidwell, Cal.: on the afternoon of the 29th snow fell to a depth of about one and a half inches on the mountains west of this place, at an elevation of 2,000 feet above Fort Bidwell.

Snow is also reported to have fallen at Pike's Peak, Colo., on the 3d to 5th, 10th, 13th to 15th, 17th, 22d to 25th, 28th; the snowfall for these dates aggregating 0.2 inch.

HAIL.

Under the heading "Local storms" will be found descriptions of the more severe hail storms which have occurred during the month. In addition to these, hail was reported to have fallen in the various states and territories as follows:

Alabama.—Mobile, 9th.

Arizona.—Fort Verde, 11th; Fort Apache, 19th.

Arkansas.—Lead Hill, 14th.

Colorado.—Pike's Peak, 1st, 5th, 6th, 9th, 13th to 16th, 18th, 21st to 23d, 26th; Colorado Springs, 3d, 21st; Denver, 24th; Fort Lewis, 28th.

Dakota.—Bismarck and Richardton, 2d; Deadwood, 2d, 4th; Fort Randall, 8th; Yankton, 20th.

Illinois.—Cairo, 15th; Chicago, 18th.

Kansas.—East Norway and West Leavenworth, 20th.

Kentucky.—Louisville, 2d.

Massachusetts.—Fall River and Taunton, 30th.

Michigan.—Swartz Creek, 18th.

Montana.—Fort Maginnis, 30th.

Nebraska.—Sidney, 1st, 21st; Genoa, 4th, 8th; Omaha, De Soto, and Tecumseh, 20th; Fort Robinson, 23d.

Nevada.—Winnemucca, 31st.

New Hampshire.—Mount Washington, 29th.

New Jersey.—Beverly, 20th; Readington, 23d.

New York.—Plattsburg Barracks, 29th.

Oregon.—Linkville, 25th.

South Carolina.—Spartanburg, 17th.

Texas.—San Antonio, 28th.

Utah.—Frisco, 9th; Salt Lake City, 13th.

Wisconsin.—Milwaukee, 4th.

Wyoming.—Fort Laramie, 1st, 22d; Fort Bridger, 14th, 23d; Cheyenne, 21st.

DROUGHT.

California.—San Diego, 31st: the total rainfall at this station during the last four months amounts to but 0.52 inch. On account of the continued dry weather there are but few flowers in bloom and, in consequence, the yield of honey in this county will be very small in comparison with the product of former years.

Illinois.—Mattoon, Coles Co.: the drought was broken by the rain of the 11th.

Greenville, Bond Co.: after drought of many weeks, a good rain fell on the 11th.

Danville, Vermillion Co., 11th: the rain of this date was the first of any consequence that has fallen since July 2d.

Carthage, Hancock Co.: the severe drought continues in this section. Stock is driven from all parts of the county to the artesian well at Carthage for water.

Anna, Union Co., 12th: the protracted drought was broken by a heavy rain on this date.

Pittsfield, Pike Co.: the first heavy rain of the season occurred on the afternoon of the 16th.

Alton, Madison Co.: the drought was broken by a heavy rain on the 16th.

Quincy, Adams Co.: the first rain since July 3d fell on the afternoon of the 16th.

Cerro Gordo, Cerro Gordo Co., 17th: heavy rains have fallen throughout this section; late corn and potatoes will be much improved.

Moweaqua, Shelby Co., 17th: the drought which prevailed in this section during the last two months was broken by a heavy rain on this date.

Tolono, Champaign Co.: water in the Okaw and Embarras rivers began to run on the 17th; both of these streams had been dry southward of this place to beyond the Douglas county line. A heavy rain fell on the 16th, greatly improving vegetation.

Illiopolis, Sangamon Co., 17th: the first heavy rain since May occurred on this date; pastures will be improved, but the rain was too late to be of benefit to corn.

Lincoln, Logan Co.: a heavy rain fell on the 17th; this rain was too late to help corn, but pastures will be greatly benefited.

Cairo, 31st: late corn is suffering for rain; the tobacco crop is in excellent condition.

Indiana.—Terre Haute: the rain which fell on the afternoon of the 4th broke the prevailing drought; 0.66 inch fell in about forty minutes, being the first rain since July 22d; many crops are entirely ruined by the drought. The Wabash River is said to be lower than was ever known before.

The following is from the Saint Louis "Globe-Democrat" of August 13, 1887:

INDIANAPOLIS, IND., *August* 12.—During the past twenty-four hours central Indiana has been favored with a much needed fall of rain, and, as far as can be learned, the drought has been broken in all parts of the state. More water is needed, but that which has already fallen will prove of great benefit in reviving vegetation. Railway officials are much encouraged, and some of them report that the corn crop along their lines will be very nearly up to the average. This is particularly true of the lines to the west and southwest. The rains have put new life into the grass and potato crops, and unless there is a recurrence of dry weather, the agriculturalists will receive substantial returns from both.

Iowa.—Dubuque, 11th: rain fell throughout northwestern Iowa during the night of the 10–11th; the grain crops and pasturage will be greatly improved.

Creston, Union Co.: the long-continued drought was broken by rain of the 16th.

Cedar Rapids, Linn Co., 31st: this has been another dry month; Cedar River is still below low-water mark; the few light showers that have fallen only moistened the top of the ground.

Kansas.—Wamego, Pottawatomie Co.: a heavy rain fell during the 4th and 5th, the first in thirty days; though too late for corn, it revived vegetation and started streams and springs.

Yates Centre, Woodson Co., 31st: the month was generally hot and dry, there being but one heavy rain, viz., 1.06 inches, on the 16th; water for stock has been, and still is, very scarce.

Kentucky.—Louisville, 15th: the drought which has prevailed in this section for nearly three months was broken by the rain on the night of the 14–15th.

Elkin, Clark Co., 31st: the prevailing drought has done much injury to crops, especially to tobacco.

Louisiana.—Grand Coteau, Saint Landry Parish, 31st: cotton and corn are suffering severely from drought; planters report that cotton will yield about three-fourths of the previously estimated crop.

Michigan.—Thornville, Lapeer Co.: the heavy rain which fell on the 10th broke the long and severe drought.

Lansing, 10th: the rain of this date is the first of consequence since July 21st.

Saugatuck, Allegan Co., 16th: the recent rains have benefited late potatoes and corn.

The August report of the Michigan Weather Service contains the following:

The greatest duration of drought reported by the voluntary observers of the service occurred at Chelsea, Washtenaw Co., and Decatur, Van Buren Co. No rain fell from July 5th to August 9th, inclusive, a period of thirty-seven days. Other stations report the duration of the drought from eighteen to thirty days; this includes the months of July and August. The lack of rainfall was general throughout the central and southern sections from July 23d to August 10th, when rain occurred.

Mississippi.—University, Lafayette Co.: the rain of the 26th broke the severe drought in this locality, and was of much benefit to all growing crops. No rain of any consequence had fallen since the 6th and drought prevailed all over the state, causing much injury to cotton; it is considered that the cotton crop will fall one-third below the estimate of two weeks ago.

Missouri.—Jackson, Cape Girardeau Co.: the drought in this vicinity was broken by a very heavy rain on the 12th. Previous to this rain none had fallen since June 8th.

Boonville, Cooper Co.: the first heavy rain for nearly three months fell on the 12th. Crops and pastures will be greatly benefited.

Lamar, Barton Co.: the drought which has been very injurious to pastures and corn was broken by the rain on the 22d.

Fayette, Howard Co.: the high temperature and small rainfall has, in this immediate locality, severely injured the corn crop, and water is becoming scarce.

Nebraska.—Brownville, Nemaha Co.: the protracted drought was broken on the 10th, when 2.25 inches of rain fell.

Ohio.—The "Chicago Tribune" of August 10th contained the following:

TOLEDO, OHIO, *August* 9—All over southern Michigan, northern Indiana, and northwestern Ohio farmers are suffering as never before from the drought. There has been no rain since July 4, and practically none since the last of May, as the June showers were very light. Cattle are driven long distances for water, wells are giving out, and in many of the smaller cities the water-works have failed. The late potato crop is a total failure, and unless rain comes soon corn will not yield half a corp. Buckwheat and turnips have not come up yet, though planted weeks ago. Small fruits and garden vegetables are blighted.

The following is from the Saint Louis "Globe-Democrat" of August 13, 1887:

CINCINNATI, OHIO, *August* 12.—The drought in this portion of Ohio began in the early part of June, and though it has not been wholly unbroken it has been practically so in nearly all of southern Ohio. The rain of last night here amounted to .36 of an inch, and is the heaviest rainfall since the early part of June. The effect has been felt chiefly in pastures, hay, potatoes, and all vegetables. Corn in all parts of southern Ohio has been more or less injured, though in the plains of Fayette, Madison, and Clark counties the injury is less than in the dry limestone soil of the valleys. If rains should follow this one the upland corn would yet be improved, but in the valleys the damage is past repair. Potatoes are everywhere reported as a virtual failure, and it is hard to see a prospect for a crop, no matter how much rain may come. The chief benefit now from rain will be in reviving pastures and in enabling farmers to prepare for sowing wheat.

Norwalk, Hiram Co.: the rain on the 17th broke the protracted drought which prevailed in this vicinity.

Garretsville, Portage Co., 17th: the fine rain of this date greatly improved the appearance of the vegetation, but it came too late to help crops.

Pennsylvania.—Erie: the rain of the 4th was much needed; only 0.80 inch has fallen since July 1st.

Tennessee.—Ashwood, Maury Co., 31st: on account of the prevailing drought in this portion of the county, corn will not yield more than half a crop; the cotton crop is in splendid condition, and is at least two weeks more advanced than usual at this season.

West Virginia.—Middlebrook, Randolph Co., 31st: on account of the prevailing drought pastures and meadows are drying up; springs that were never known to fail before are now dry; cattle are beginning to suffer for water, as most of that available is in stagnant pools.

Wisconsin.—Racine, Racine Co., 8th: the drought continues in this county, and crops of all kinds are almost ruined.

La Crosse: the long drought was broken by copious showers on the 13th and subsequent dates; vegetation is growing very rapidly, and it will soon be unnecessary to feed stock on hay, as pastures are now in promising condition.

Marshfield, Wood Co., 16th: the protracted drought has been broken by recent rains.

WINDS.

The most frequent directions of the wind during August, 1887, are shown on chart ii, by arrows flying with the wind. In the Missouri Valley, west Gulf states, and southern slope, the most frequent directions were southerly; in the Ohio Valley, east Gulf states, and on the Atlantic coast, south of New England, they were northerly; in the Saint Lawrence Valley and on the Pacific coast, westerly; in the Lake region and Rocky Mountain districts, variable.

HIGH WINDS (in miles per hour).

During August no wind-velocities exceeding fifty miles per hour were reported in addition to the maximum velocities given in the table of miscellaneous meoteorological data, with the exception of those reported from Mount Washington, N. H., viz., 83 nw., 18th, and 90 nw., 19th.

LOCAL STORMS.

Knoxville, Tioga Co., Pa.: between 2 and 3 p. m. on the 1st a violent rain and hail storm passed south of this place, levelling forests and orchards in its path.

New Britain, Hartford Co., Conn.: very severe thunder-storms occurred in this vicinity during the night of the 1st–2d, causing much damage to buildings, etc.; seven dwellings and three barns were struck by lightning, while in the surrounding country many trees and telegraph poles were shattered. Reports show that severe electrical storms occurred during the 1st and 2d at many points in Massachusetts and Connecticut, and a large amount of damage was done by lightning.

Parkston, Hutchinson Co., Dak.: a severe wind, rain, and hail storm occurred on the 2d; hail-stones the size of filberts fell in sufficient quantities to nearly cover the ground; the storm caused serious damage to grain fields.

Louisville, Ky.: a thunder-storm, accompanied by heavy rain, set in at 3.25 and ended at 4.58 p. m. on the 2d; hail fell from 3.38 to 3.49 p. m., some of the hail-stones measuring one-half inch in diameter.

Charleston, W. Va.: a severe wind and rain storm occurred here on the afternoon of the 2d, during which Cotton Opera House was unroofed and several other buildings damaged.

Trees and shrubbery were uprooted and a number of boats blown from their moorings.

Elmira, Chemung Co., N. Y.: during the afternoon of the 2d a severe wind and hail storm passed over the village of Wellsburg and vicinity, about six miles east of Elmira. At some points the storm was accompanied by hail which broke windows and ruined crops. The damage is estimated at $20,000.

Saratoga, New York: damage to the extent of several thousand dollars was done by the severe storm which occurred on the afternoon of the 2d. Many trees were prostrated, and the streets were badly washed by the heavy rain.

The Signal Service observer at Wood's Holl, Mass., reports, relative to the storm of the 2d, as follows:

The storm began with light rain at 10.28 a. m.; afterwards, at 10.50, changing to heavy; for the next four hours the rain continued uninterruptedly, pouring down copiously, flooding the streets, gutters, and by-ways. At 3 p. m., the unprecedented and extraordinary rainfall of 6.81 inches was measured. Some thunder and lightning accompanied the storm.

Tarborough, Edgecombe Co., N. C.: during a period of eighteen hours, on the 2d and 3d, more than thirteen inches of rain fell at this place. This remarkably heavy rain appears to have been confined to the territory between the Tar and Roanoke rivers. It is estimated that the crops in this county have been damaged 25 per cent., or more. Many of the largest farms in the county were entirely submerged. This heavy rainfall caused a rise of about twelve feet in the Tar River.

Kitty Hawk, N. C.: an unusually heavy rain began during the night of the 2–3d and ended at 10.30 a. m. on the following day; more than four inches of rain fell during the storm. The crops in this vicinity were greatly injured by the heavy rains.

Muscatine, Muscatine Co., Iowa: a destructive wind storm from the south occurred here at 4 p. m. on the 3d; many buildings were unroofed or otherwise damaged.

Wilmington, N. C.: the heavy rain which commenced at 5.40 p. m. on the 3d continued at intervals until 3 a. m. on the 5th, causing serious damage to the growing crops in this vicinity, especially to corn. Nearly seven inches of rain fell at this place during the 3d and 4th.

Memphis, Tenn.: it is reported that the rain and wind squall which occurred at Brady's Station, twenty-two miles east of this city, on the 3d, caused damage to crops, barns, and fences to the extent of $5,000.

Allison, Decatur Co., Kans.: during the severe wind storm on the 4th, numerous trees and small houses in this locality were blown down; the severest part of the storm, however, passed south of this place.

North Platte, Nebr.: a high wind, reaching a maximum velocity of fifty-four miles per hour, occurred on the afternoon of the 4th; the storm was accompanied by hail of considerable size; some damage was done to signs, trees, and windows.

Kewaunee, Kewaunee Co., Wis.: a severe hail storm occurred in this vicinity during the evening of the 4th. Many windows were broken and much damage was done to fields of standing grain.

The following is from the Chicago "Daily Inter-Ocean" of the 6th:

ATCHISON, KANS., *August* 5.—A destructive cyclone swept over the Solomon Valley last night, destroying a large number of houses, killing four persons at Millbrook, Graham Co., and wounding several others. The cloud came from the northwest so suddenly that the people had no time to make preparations for escape. In addition to the destruction at Millbrook, the towns of Hill City, Graham Co., and Plainville, Rooks Co., also suffered seriously.

The following is from the Chicago "Inter-Ocean" of August 6, 1887:

DELPHI, IND., *August* 5th.—A terrific wind, rain, and hail storm passed over the southern part of this (Carroll) county last evening. Scarcely a stalk of corn was left standing in the track of the storm. Fences were blown down and many barns were unroofed. The storm resembled a tornado and covered an area of half a mile in width.

Louisville, Ky.: light rain, accompanied by strong gale from the west, prevailed from 5 to 5.50 p. m. on the 5th; the wind reached a maximum velocity of forty-eight miles per hour; considerable damage, such as blowing down signs and breaking of windows, was done throughout the city.

Oil City, Venango Co., Pa.: a large amount of damage was done in this vicinity by the storm which occurred during the evening of the 5th. Shade trees were twisted off and the streets blockaded with débris. Telegraph lines were prostrated in all directions and crops in surrounding country seriously injured.

Franklin, Venango Co., Pa.: during the night of the 5–6th a vast amount of damage was done in this vicinity by a violent storm. The heavy rainfall caused the inundation of the western part of the town.

Fort Buford, Dak.: a thunder-storm from the southwest began at 7.41 p. m. on the 7th and continued until after midnight; the storm was preceded and accompanied by high northeasterly winds, with a maximum velocity of fifty miles per hour. No damage resulted.

Republican City, Harlan Co., Nebr.: nearly all of the buildings in this town were destroyed by the severe storm which occurred about 6 p. m. on the 8th. Reports state that this storm had not the characteristics of a tornado, but was a "straight blow" which continued for twenty minutes. A building in course of construction was blown down and eight workmen were buried in the ruins; many other persons were injured, some fatally, by falling timbers, etc., in various parts of the town.

The following is from the "Oswego Daily Times" of the 9th:

WINNIPEG, MANITOBA, *August* 9.—Southern Manitoba was visited by a terrific hail storm yesterday morning, doing great damage to crops. Some of the hail-stones were several inches in circumference. The injury to wheat has been very severe and a number of farmers will not be able to reap seed grain, so complete was the destruction by the storm.

Milwaukee, Wis.: a severe storm, during which the wind reached a maximum velocity of forty-eight miles per hour, prevailed during the evening of the 9th, the most violent part of the storm occurring between 8 and 9 p. m. Several frame buildings in course of completion at the Fair grounds in the the northwestern part of the city were completely wrecked.

Delavan, Walworth Co., Wis.: the damage done in this county by the storm of the 10th amounts to several thousand dollars.

Dubuque, Iowa: on the afternoon of the 10th an unusually severe thunder-storm occurred; lightning struck in several places in this city, causing no serious damage, but in the surrounding country buildings and hay-stacks were destroyed. The storm moved to the southeast.

Renville, Renville Co., Minn.: during the evening of the 10th a severe hail storm occurred at this place, causing considerable damage to buildings.

Milwaukee, Wis., 11th: reports from various parts of Wisconsin show that the rain on the night of the 10–11th was general throughout the state, and in some places severe local storms occurred. At Richland Centre, Richland Co., several buildings were unroofed, and much window-glass was broken by hail. At Muscoda, Grant Co., two barns were struck by lightning and burned, together with three hundred tons of hay and many farming implements. Considerable damage was also done by lightning at Lancaster, Grant Co.

Carlisle, Cumberland Co., Pa.: damage estimated at $25,000 was done in the Cumberland Valley by the wind, rain, and hail storm during the afternoon of the 11th. Barns were blown down, dwellings unroofed, and trees uprooted.

Harrisburg, Pa.: a severe storm passed over this city during the afternoon of the 11th, unroofing a number of buildings. The damage is estimated at from $15,000 to $20,000. The storm moved from west to east.

Philadelphia, Pa.: the thunder-storm which began at 6.15 p. m. on the 11th was followed half an hour later by a sudden and violent wind and rain squall from the west, which continued for about ten minutes; for five minutes the wind blew at the rate of forty-five miles per hour. Signs and shutters were blown down and some injury done to telegraph lines.

Lexington, Rockbridge Co., Va.: several houses were unroofed during the storm which occurred at about 4 p. m. on the 12th. The heavy rainfall flooded the lower part of the town. The storm was accompanied by hail, and much damage was done to crops and gardens.

Fort Buford, Dak.: a destructive thunder-storm passed over this place between 8.52 and 9.25 a. m. on the 12th. During the night of the 12–13th another severe storm occurred, the wind reaching a velocity of thirty miles per hour. Several washouts occurred on the Saint Paul, Minneapolis, and Manitoba Railway, delaying trains for several hours.

Lead Hill, Boone Co., Ark.: a severe thunder-storm, accompanied by high wind, rain, and hail, occurred on the afternoon of the 14th; the storm caused serious damage to the corn crop.

Danville, Pittsylvania Co., Va.: a destructive hail storm occurred in portions of Pittsylvania and Halifax counties during the night of the 17–18th. Over a strip of country one mile wide, extending from Ringgold to Pace's, the tobacco crop was badly damaged. Reports from Caswell county, N. C., state that the tobacco crop was badly damaged in the vicinity of Yanceyville, Gatewood, and other points in that county. No hail fell at Danville.

Columbia, S. C.: at 9.30 p. m. on the 18th a very severe thunder-storm occurred; it was attended by an unusual electrical display, the lightning flashes being almost continuous, with loud and rapid peals of thunder, which caused buildings to rattle and vibrate. The switch-board at the Western Union Telegraph office was burned out, and several trees in various parts of the city were struck by lightning. The storm was accompanied by high wind for a few minutes.

Portland, Me.: a severe gale, accompanied by heavy rain, began at 9.50 a. m. on the 18th, attaining a maximum velocity of forty-five miles per hour from the south at 1 p. m.; this was the most severe storm of the season. Many large trees in this vicinity were blown down, but no other damage was reported.

Fort Custer, Mont.: a severe thunder-storm occurred at this place at 9.35 p. m. of the 19th; it was accompanied by heavy rain, and the wind reached a maximum velocity of sixty miles per hour from the northwest at 11.03 p. m. No damage has been reported.

Wash Woods, N. C.: a severe storm began during the night of the 19–20th and continued until 2.30 p. m. on the following day; the storm was most violent from 10 to 11.30 a. m. Great damage was done to telegraph lines, buildings, fences, etc.

Kitty Hawk, N. C.: a storm of unusual severity, accompanied by heavy rain, set in from the southeast at 5.45 a. m. on the 20th; subsequently the wind backed to east and north and increased in force until 10 a. m., at which time its greatest violence was attained; at this time the anemometer was blown away, and hence no accurate velocity of the wind during the storm can be given. Large pebbles, shells, and fragments of wood were hurled through the air with great violence; the windows of the signal office were broken and the window blinds torn from their hinges; trees were torn up and crops injured to a great extent; the telegraph lines were seriously damaged by the storm, cutting off communication with Hatteras, N. C.

Hatteras, N. C.: a heavy rain and wind storm began at 3.30 a. m. and ended at 12.50 p. m. on the 20th, the maximum velocity of the wind, eighty miles per hour from the southeast, occurring at 6.45 a. m. The tide was very high during the storm and submerged the whole island; gardens were completely ruined and trees torn up by the roots; mills, buildings, and fences were blown down. Eight dwellings and a number of out-buildings were blown down and swept away by the tide. The schooners "J. L. Myers" and "Cherubine" were dismasted, and the schooner "Dexter," while lying at anchor in the harbor, was capsized; the schooner "J. L. Wilson" drifted from harbor with anchors out.

Chicamicomico, N. C.: high wind, accompanied by heavy rain, began during early morning and ended at 9.30 a. m. of the 20th; much damage was done to the telegraph lines, cutting off communication with Hatteras and all northern stations.

Atchison, Atchison Co., Kans.: about 4 p. m. on the 20th a violent hail storm passed over this city. Hail fell for about half an hour, some of the hail-stones being very large. Much damage was done, nearly all windows of northern exposure having been broken. Crops in the surrounding country sustained serious injury.

Saint Joseph, Mo.: a violent hail storm passed in a direction from northwest to southeast over Richardson county, Nebr., and Brown and Doniphan counties, Kans., during the afternoon of the 20th. The width of the storm's path was about two miles, within which windows were broken, trees stripped of foliage, and large numbers of small animals killed.

The following is from the "New York Daily Tribune" of the 23d:

MOUNT HOLLY, N. J., *August* 22.—A terrific storm of wind and rain raged along the sea coast last night. About midnight the sea ran extremely high and made a clear breach across the strip of beach traversed by the Long Beach Railroad, causing a number of washouts. At one point several miles north of Beach Haven the sea cut a channel across the beach, washing away the track for a considerable distance, so that it will be impossible to run trains for some time. The Pennsylvania Railroad Company secured a number of sail-boats and succeeded in transferring several Philadelphia passengers across the break to the Quakertown Railroad, which ran a special train to Philadelphia.

Baltimore, Md.: reports from Hagerstown, Washington Co., state that during a severe storm which occurred at that place on the 22d buildings were unroofed and numerous trees blown down.

The "New York Daily Tribune" of August 24th, 1887, contained the following:

LONDON, ONTARIO, *August* 23.—A heavy storm passed over the country north of here this morning, doing considerable damage to fences and telegraph lines, unroofing houses and blowing down chimneys and trees. The storm, which was accompanied by hail, lasted only a few minutes, passing on eastward.

INGERSOLL, ONTARIO, *August* 23.—A heavy wind and hail storm passed over this place last night. A number of buildings were damaged and many trees were prostrated. The roof of the gas-works was blown off and a large chimney at the bell mill was blown down, falling on the mill and doing considerable damage.

Lancaster, Lancaster Co., Pa.: a violent rain storm, accompanied by hail, passed over this county during the night of the 23d–24th. More than three inches of rain fell within an hour, flooding many cellars.

Yates Centre, Woodson Co., Kans.: a report from Hutchinson, Reno Co., Kans., states that a severe hail storm occurred at that place on the 24th, causing serious damage to property.

Norfolk, Va.: a storm of considerable severity began at 5 a. m. on the 25th; the wind reached a maximum velocity of thirty-four miles per hour from the northeast; but little damage resulted.

Mr. J. C. Berry, voluntary observer at Cedar Hill, Dallas Co., Tex., reports:

The storm of the 29–30th was very destructive. The damage to crops in the valleys, especially in those of the Trinity River and Mountain Creek was very great, fully one-half of the bridges having been washed away. Several persons and much stock were drowned. The rain was general throughout the northern and central portions of the state, and appears to have been heaviest over an area extending from Dallas to Cleburne. The storm was not accompanied by high wind in this vicinity. Rivers and smaller streams in some instances rose at the rate of one foot per minute and reached the highest stages known for many years.

Fort Custer, Mont.: a thunder-storm prevailed during the afternoon of the 30th; high easterly winds began at 5.45 p. m. and continued during the remainder of the day, a velocity of thirty miles per hour occurring at 7 p. m. The storm was very destructive north of this place and caused washouts on the Northern Pacific Railroad.

COTTON REGION REPORTS.

In the following table are given the means of the maximum and minimum temperatures, and the average rainfall for the cotton-belt districts during the month. For the purpose of comparison the means for the five preceding years are also given.

In the Galveston district the rainfall of August is largely in excess of the average, but in the other districts bordering on the Gulf, and in Arkansas and Memphis districts, no marked departures occur, though the precipitation is generally deficient. Deficiencies also occur in Savannah and Charleston districts, while nearly double the average amount of rain fell in the district of Wilmington.

The means of the maximum and minimum temperatures, as compared with the normals, show that with respect to temperature the average August conditions prevailed during the month:

Temperature and rainfall data for the cotton districts, August.

Districts.	Rainfall.			Temperature.							
				Maximum.			Minimum.			Extremes for Aug., 1887.	
	Average for August of five preceding years.	Average for August, 1887.	Departures.	Mean for Aug. of five preceding years.	Mean for Aug., 1887.	Departures.	Mean for Aug. of five preceding years.	Mean for Aug., 1887.	Departures.	Max.	Min.
	Inch.	*Inch.*	*Inch.*	°	°	°	°	°	°	°	°
New Orleans	3.86	3.34	— 0.52	91.4	92.1	+ 0.7	71.2	71.1	— 0.1	102	60
Savannah	5.64	5.00	— 0.64	90.8	91.8	+ 1.0	71.5	71.0	— 0.5	103	54
Charleston	6.67	4.70	— 1.97	89.4	89.7	+ 0.3	69.1	70.5	+ 1.4	100	45
Atlanta	4.58	7.09	+ 2.51	88.0	87.3	— 0.7	67.7	68.3	+ 0.6	99	40
Wilmington	4.88	9.50	+ 4.62	88.0	86.7	— 1.3	67.6	67.8	+ 0.2	101	51
Memphis	2.89	2.05	— 0.84	88.7	91.2	+ 2.5	66.4	67.6	+ 1.2	106	40
Galveston	2.37	4.02	+ 1.65	93.8	94.4	+ 0.6	71.0	72.3	+ 1.3	103	52
Vicksburg	2.97	3.50	+ 0.53	90.5	91.7	+ 1.2	69.6	72.5	+ 2.9	101	58
Montgomery	3.59	2.60	— 0.99	90.4	89.9	— 0.5	68.5	70.1	+ 1.6	98	49
Augusta	3.95	5.47	+ 1.52	89.9	88.3	— 1.6	68.2	68.9	+ 0.7	101	52
Little Rock	2.37	2.13	— 0.24	91.1	91.3	+ 0.2	66.3	67.0	+ 0.7	104	37
Mobile	3.05	2.87	— 0.18	92.0	92.8	+ 0.8	69.6	67.7	+ 1.9	104	50

INLAND NAVIGATION.

STAGE OF WATER IN RIVERS AND HARBORS.

In the following table are shown the danger-points at the various river stations and the highest and lowest depths for August, 1887, with the dates of occurrence, and the monthly ranges:

Heights of rivers above low-water mark, August, 1887.

[*Expressed in feet and tenths.*]

Stations.	Danger-point on gauge.	Highest water.		Lowest water.		Monthly range.
		Date.	Height.	Date.	Height.	
Red River:						
Shreveport, La	29.9	1	6.1	31	0.1	6.0
Arkansas River:						
Fort Smith, Ark	22.0	45	2.0	15	0.7	1.3
Little Rock, Ark	23.0	1	2.3	16, 17	1.6	0.7
Missouri River:						
Omaha, Nebr	18.0	4, 5, 6	9.9	29, 30, 31	7.9	2.0
Leavenworth, Kans	20.0	1	11.6	23, 31	8.9	0.7
Mississippi River:						
Saint Paul, Minn	14.5	3	2.5	14	1.9	0.6
La Crosse, Wis	24.0	16, 17, 18	3.2	7, 8, 9, 31	2.7	0.5
Dubuque, Iowa	16.0	22, 23	3.1	10	2.1	1.0
Davenport, Iowa	15.0	15	2.7	10	0.9	1.8
Keokuk, Iowa	14.0	16, 17	1.7	12	0.7	1.0
Saint Louis, Mo	32.0	1	9.8	30, 31	7.1	2.7
Cairo, Ill	40.0	11, 12	8.7	26, 27	4.8	3.9
Memphis, Tenn	34.0	1	8.2	29	5.2	3.0
Vicksburg, Miss	41.0	1	7.1	31	1.5	5.6
New Orleans, La	13.0	31	3.9	25	2.1	1.8
Ohio River:						
Pittsburg, Pa	22.0	2, 20	6.1	1	4.9	1.2
Cincinnati, Ohio	50.0	2, 4, 5	6.0	26, 31	4.1	1.9
Louisville, Ky	25.0	3	3.9	31	2.8	1.1
Cumberland River:						
Nashville, Tenn	40.0	6	2.0	25, 27 to 31	0.1	1.9
Tennessee River:						
Chattanooga, Tenn	33.0	6	10.6	3, 25, 26	3.3	7.3
Monongahela River:						
Pittsburg, Pa	29.0	2, 20	6.1	1	4.9	1.2
Savannah River:						
Augusta, Ga	32.0	10	33.9	28	8.0	25.9
Sacramento River:						
Red Bluff, Cal		1	0.6	31	0.4	0.2
Sacramento, Cal		1	8.1	26 to 31	7.4	0.7
Willamette River:						
Portland, Oregon		1	12.1	30, 31	5.8	6.3

Clinton, Clinton Co., Iowa: the Mississippi River was very low at the close of the month, it being only nineteen inches above low-water mark.

Cairo, Ill.: owing to the low stage of water in the Ohio River the steamer "Bald Eage" was aground for forty-eight hours at a point seven miles north of this city on the 22d.

Fort Buford, Dak.: the Missouri River was very low and navigation difficult on the 17th. On the 22d boats were delayed on account of low water.

HIGH TIDES.

Atlantic City, N. J.: the tide was very high on the 20th and 25th; several pavilions and sections of the board walk along the beach were washed away.

Chicamicomico, N. C., 20th: Wash Woods, N. C., 25th, 28th.

FLOODS.

Wilkesbarre, Pa: three distinct thunder-storms met over this place at 1.35 p. m. on the 1st, viz., one from the north, one from the south, and one from the east; they were accompanied by heavy rain which caused a freshet in the creek north of station; houses, bridges, etc., along the creek were washed away.

Kitty Hawk, N. C.: the heavy rain which began during the night of the 2d ended at 10.30 a. m. of the 3d; the total rainfall amounted to 4.27 inches and seriously injured the crops in this vicinity.

Columbia, S. C.: the Congaree River overflowed on the 6th, causing serious injury to crops on adjacent bottom lands.

Augusta, Ga.: the freshet of the latter part of July in the Savannah River continued until August 11th, the water reaching its greatest height, 33.9 feet, on the 10th. On the 1st of the month the water had receded sufficiently to permit the resumption of business in the overflowed section of the city, but the subsequent rises caused further interruption of business. On the 9th the city was for the second time entirely surrounded by water. The river fell rapidly on the 11th.

Savannah, Ga.: the Savannah River was very high on the 9th and the plantations along its banks were flooded, resulting in great damage to the rice crop; the river continued very high on the 10th and 11th, flooding the lowlands opposite this city; on the 12th the freshet began to subside.

The Savannah, Ga., "Morning News" of the 12th contained the following, relative to the flood in that vicinity:

From a position at the Vernexebre Creek a desolate and dismal picture is presented. In front, for miles, as far as the eye can see, all is a vast sheet of turbid water. Here and there, at irregular intervals, are seen the waving bushes and reeds that dénote where the division lines were, while the twisted and overthrown bridges that crossed the canals and the bare frames of the flood-gates add much to the distressing features of the scene. In different directions around are seen the huge, tall, brick chimneys looming up as if standing in the sea, and the buildings at the settlements all appear low on the water and as if partially immersed. The scene of desolation and ruin is complete. Not a single sign was left to tell of the crop on which so much money, time, and work had been expended. The flooded district at this point is about four miles wide, the water being six to seven feet deep on an average.

In the same issue of the above-named paper was given a de-

tailed statement of the farms inundated in the vicinity of Savannah, in which statement the total area of the submerged farms is estimated at more than 9,000 acres, about 60 per cent. of which was under cultivation.

Greenfield, Franklin Co., Mass.: the heavy rains on the 18th caused numerous washouts on the railroads in this county.

The following is from "The New York Tribune" of August 24th:

CHARLESTON, S. C., *August* 23.—Reports received this morning from the inundated rice fields of the South Santee indicate that the damage is not general. High tides have prevented the freshet from covering the large plantations of the southern district along the river, and the greater part of the crops is considered safe. On the North Santee colored planters on small farms have suffered disastrously, their crops being reported as totally destroyed.

Cleburne, Johnson Co., Tex.: the unusually heavy rainfall on the 30th caused freshets in East and West Buffalo creeks; many houses and fences were washed away, and several persons drowned.

The following is from the "Chicago Tribune" of the 31st:

FORT WORTH, TEX., *August* 30th.—North Texas is being visited by unprecedented rains for the month of August. It is a rare thing for more than enough rain to fall in August to lay the dust. Up to yesterday three heavy rains had fallen during the month, but they were not general. Yesterday afternoon it began to rain, and for twenty-four hours has kept it up almost continually. Rivers and streams have risen from five to twenty feet. The Trinity, Brazos, and Red Rivers are out of their banks for the first time in two years. The rain of yesterday and to-day has been general, and has averaged three inches throughout this section. One week ago, at Waco, prayer-meetings were held to pray for a cessation of the long drought. To-night people on the lowland are moving out of their homes to keep from being drowned. Serious washouts are reported south of here on both the Missouri Pacific and the Santa Fé. The Santa Fé bridge across the Wichita, in the Indian Territory, is in danger from a large amount of driftwood in the river. The flood at Cleburne is most severe. A little creek called Buffalo Bayou was turned into a raging torrent in twelve hours, carrying away houses, farms, bridges, and everything in its course. One family, consisting of nine persons, was carried away and drowned before they could get out of their house. Great damage has been done in every direction. As far as heard from eleven people have been drowned.

The following is from the Saint Louis, Mo., "Globe-Democrat" of September 1, 1887:

FORT WORTH, TEX., *August* 31.—At noon to-day heavy rains began falling in this section and continued for several hours. The Trinity River was higher to-day than yesterday, and reports reach the city to-night of two serious washouts on the Fort Worth and Rio Grande Railroad. All trains north and south on the Missouri Pacific have been abandoned, except a local to Denison. No trains are running either north or south on the Gulf, Colorado, and Santa Fé, and no trains on the Houston and Texas Central between Fort Worth and Waxahachie. The Texas and Pacific is still in trouble near Eagle Ford. A north-bound Missouri Pacific train, due here Monday night, is isolated between two floods at a point between Itaska and Grand View, and there is no prospect of its relief until to-morrow night. The passengers have suffered considerably from hunger.

Tucson, Ariz., 31st: the heavy rains during the month in the surrounding mountains have caused numerous freshets in the Santa Cruz and Rillito rivers.

ATMOSPHERIC ELECTRICITY.

AURORAS.

Saint Vincent, Minn.: an aurora in the form of a whitish arch resting on a dark base was observed at 11 p. m. on the 15th; twenty minutes later a second arch appeared above the first, with a well-defined colored space between them. Numerous beams having a tremulous motion rose from the upper arch; these gradually grew larger and for about twenty-five minutes moved upward and downward, changing color from pale yellow to blue, and finally disappearing at 1.18 a. m. on the 16th.

Northfield, Vt.: an auroral display was observed from 9.00 to 10.15 p. m. on the 31st; it consisted of bright streamers extending upward about 20°, and azimuth 80°; the display was most brilliant at 9.30 p. m.

Eastport, Me.: an auroral arch was observed from 8.10 to 9.45 p. m. on the 14th; it extended from the northwest to northeast and to an altitude of about 130°; four beams reaching an altitude of about 5° were seen between 8.30 and 9.00 p. m.

Auroras were noted on other dates as follows:

1st, Cresco, Iowa. 9th, Vevay, Ind. 11th, Poplar River, Mont. 13th, Eastport and Orono, Me.; Nashua, N. H.; Egg Harbor City, N. J.; Northfield, Vt. 14th, Webster, Dak.; Eastport and Orono, Me.; Saint Vincent, Minn.; Poplar River, Mont.; Nashua, N. H. 15th, Forts Buford and Totten, Dak.; Saint Vincent, Minn. 16th, Poplar River, Mont.; Egg Harbor City, N. J. 20th, Boston, Mass. 23d, Vevay, Ind.; Duluth, Minn. 28th, Webster, Dak.; Eastport, Me.; Traverse City, Mich.; Manitowoc, Wis. 29th, Fort Totten, Dak.; Moorhead, Minn.; Poplar River, Mont. 31st, Pekin, Ill.

THUNDER-STORMS.

Thunder-storms are reported to have occurred in the various states and territories on the several dates as follows:

1st.—Ark., Colo., Conn., Dak., Fla., Ga., Ill., Ind. T., Kans., Ky., La., Md., Mass., Mich., Miss., Mont., Nebr., N. J., N. Y., N. C., Ohio, Oregon, Pa., S. C., Tenn., Tex., Va., W. Va., Wis., Wyo.

2d.—Ala., Ark., Conn., Dak., Fla., Ga., Ind., Ky., Mass., Mich., Minn., Miss., Mont., Nebr., N. H., N. J., N. Y., N. C., Pa., S. C., Tenn., Tex., Vt., Va., W. Va., Wis.

3d.—Ark., Dak., Fla., Ga., Ill., Ind. T., Iowa, Kans., La., Mass., Mich., Mo., Nebr., N. J., S. C., Tenn., Tex., Wis.

4th.—Ala., Ark., Colo., Dak., Del., D. C., Fla., Ga., Ill., Ind., Iowa, Kans., Mich., Minn., Mo., Nebr., N. Y., N. C., Ohio, Pa., Tenn., Tex., Vt., Va., Wyo.

5th.—Ala., Ark., Colo., Fla., Ga., Ill., Ind., Iowa, Kans., Ky., La., Mich., Miss., Nebr., N. J., N. Y., N. C., Ohio, Pa., Tenn., Tex., Vt., Va.

6th.—Ala., Cal., Conn., Dak., D. C., Fla., Ga., Ind. T., La., Me., Md., Mass., Mont., N. J., N. Y., N. C., Pa., S. C., Tenn., Tex., Utah, Vt., Va.

7th.—Ala., Ariz., Dak., Fla., Ga., Idaho, Ind. T., Miss., Mont., Nebr., N. C., Oregon, S. C., Tex., Wash.

8th.—Ala., Ariz., Cal., Dak., Fla., Ga., Iowa, Mich., Minn., Mont., Nebr., S. C., Wis.

9th.—Ariz., Ark., Colo., Dak., Fla., Iowa, La., Mich., Mont., Nebr., Oregon, Tex., Utah, Wis., Wyo.

10th.—Ariz., Ark., Colo., Dak., Fla., Ill., Iowa, Kans., Me., Mich., Minn., Mont., Nebr., N. H., Oregon, Pa., Tenn., Tex., Vt., Wis.

11th.—Ariz., Ark., Colo., Conn., D. C., Fla., Ill., Ind., Ind. T., Iowa, Kans., Ky., Me., Md., Mass., Mich., Mo., Nebr., N. H., N. J., N. Mex., N. Y., N. C., Oregon, Pa., R. I., S. C., Tex., Utah, Vt., Va., Wash., Wis., Wyo.

12th.—Ariz., Ark., Colo., Dak., D. C., Ill., Ind., Iowa, Kans., Ky., Me., Miss., Mont., Nebr., N. J., N. C., Ohio, Pa., Tenn., Tex., Utah, Va., Wash., Wyo.

13th.—Ariz., Ark., Cal., Colo., Dak., Fla., Ill., Ind., Iowa, Kans., Mo., Mont., N. C., Tenn., Tex., Utah, Va., Wyo.

14th.—Ariz., Ark., Colo., Dak., Fla., Ga., Ill., Ind., Ind. T., Iowa, Kans., Ky., Mich., Miss., Mo., Mont., Nebr., N. C., Pa., S. C., Tenn., Tex., Utah, Va., Wis., Wyo.

15th.—Ala., Ariz., Ark., Cal., Colo., Dak., Fla., Ga., Ill., Ind., Ind. T., Kans., Ky., Mo., Mont., Nebr., N. Mex., N. C., Ohio, Pa., S. C., Tenn., Tex., Va., W. Va., Wyo.

16th.—Ala., Ariz., Ark., Colo., Dak., Fla., Ga., Ill., Ind. T., Kans., Me., Miss., Mo., Nebr., N. H., N. Mex., N. C., Pa., S. C., Tenn., Tex., Vt., Va.

17th.—Ala., Ariz., Ark., Colo., Dak., D. C., Fla., Ga., Ill., Ind., Ind. T., Iowa, La., Mich., Minn., Nebr., N. Mex., N. C., S. C., Tenn., Tex., Va., W. Va., Wyo.

18th.—Ala., Ariz., Colo., Conn., Dak., Fla., Ga., Ill., Kans., La., Mass., Mich., Mont., Nebr., N. J., N. Y., N. C., Ohio, Pa., S. C., Tex., Va., Wis.

19th.—Ariz., Cal., Conn., Dak., Fla., Ga., Ill., Iowa, Mass., Minn., Mont., Nebr., N. J., N. Y., N. C., Pa., S. C., Tex., Utah, Va., Wis., Wyo.

20th.—Ariz., Colo., Conn., Dak., Fla., Ga., Ill., Iowa, Kans., Mass., Mont., Nebr., N. H., N. J., Pa., Tex., Va., Wis.

21st.—Ariz., Colo., Dak., D. C., Fla., Ill., Ind. T., Iowa, Kans., Md., Minn., Mo., Nebr., N. J., N. Y., Tex., Va., Wis., Wyo.

22d.—Ala., Ariz., Colo., Conn., Fla., Idaho, Ill., Ind., Md., Mass., Mich., Nebr., N. J., N. Mex., N. Y., N. C., Pa., R. I., S. C., Tenn., Tex., Utah, Vt., Va., W. Va., Wis., Wyo.

23d.—Ala., Ariz., Colo., Conn., D. C., Fla., La., Md., Mass., Nebr., N. J., N. Mex., N. Y., N. C., Pa., Tenn., Tex., Utah, Va., W. Va., Wyo.

24th.—Colo., Conn., Fla., Md., Mass., Miss., N. H., N. J., N. Y., N. C., Pa., R. I., S. C., Tenn., Tex., Utah, Vt., Va., Wash., W. Va., Wis., Wyo.

25th.—Cal., Colo., Fla., Iowa, La., Mont., Oregon, Tex., Wyo.

26th.—Ala., Ariz., Cal., Colo., Fla., Ga., Kans., La., Nebr., Oregon, S. C., Tex., Wyo.

27th.—Ariz., Conn., Dak., Fla., Ga., Nebr., N. C., S. C., Wis.

28th.—Ariz., Colo., Fla., Tex., Wyo.

29th.—Ariz., Dak., Fla., Kans., Me., Mont., Nebr., Nev., N. Mex., N. Y., S. C., Tex., Vt.

30th.—Conn., Dak., Fla., Kans., Mass., Mont., Nebr., N. J., N. Y., Pa., Tex., Wyo.

31st.—Colo., Conn., Dak., Iowa, Mich., Minn., Mont., Nebr., N. Y., Tex., Wis., Wyo.

OPTICAL PHENOMENA.

HALOS.

Both solar and lunar halos appear to have been of less frequent occurrence during August than usual. The stations reporting them were widely separated, and no marked periods of frequency occurred during the month.

From the 8th to the 12th solar halos were noted at scattering stations to the eastward of the upper Mississippi valley, during the transit of low areas numbers iii and iv.

Very few stations report lunar halos prior to the 24th, and while they were not frequent on subsequent dates those observed were at scattering stations in the districts east of the Rocky Mountains. From the states bordering on the Pacific but one halo (lunar) was reported during the month, and that was observed at Port Angeles, Wash., on the 16th.

The phases of the moon, Washington mean time, during August, as given in "The American Ephemeris and Nautical Almanac" for 1887, are as follows: Full moon, 3d, 3 h. 31.9 m.; last quarter, 11th, 6 h. 28.2 m.; new moon, 18th, 12 h. 30.4 m.; first quarter, 25th, 3 h. 12.8 m.; apogee, 8th, 7.4 h.; perigree, 20th, 7.2 h.

MIRAGE.

Mirages were reported to have been observed at the following places:

Webster, Dak., 11th, 24th; Henry, Dak., 24th.
Marquette, Nebr., 15th, 19th.
Reidsville, N. C., 16th, 31st.
Moorhead, Minn., 18th, 20th.
Traverse City, Mich., 28th.

MISCELLANEOUS PHENOMENA.

FOREST AND PRAIRIE FIRES.

Mount Angel, Marion Co., Oregon: large brush fires were burning in the foot hills near this place on the 2d.

Grand Haven, Mich., 12th: forest fires burned on several days between the 3d to the 10th; on the last mentioned date it was estimated that 1,400 acres of forest were on fire south and southeast of station, causing great damage to fences and orchards. The fires entered the Lake Forest Cemetery during the night of the 8th; about one hundred lots were burned over, and a great many of the monuments were discolored. The rainfall during the night of the 11th extinguished all forest fires in this locality.

Howard City, Montcalm Co., Mich., 3d: extensive forest fires in this vicinity, and along the line of the Detroit and Lansing Railroad, have destroyed fields of grain and other property.

East Saginaw, Saginaw Co., Mich., 3d: forest fires have caused great damage to standing timber in this region, and in several instances buildings have been burned. Extensive fires have also prevailed in Clare and Gladwin counties. The damage is estimated at $50,000.

Joliet, Will Co., Ill., 5th: thousands of acres have been burned over and much valuable farm property has been destroyed by prairie fires in this part of the state.

Saint Cloud, Stearns Co., Minn., 8th: an extensive prairie fire has burned over an area of four hundred acres eight miles west of Saint Cloud, destroying the grain crops within the area named.

Carlyle, Clinton Co., Ill., 9th: during the past two weeks prairie fires have been of frequent occurrence in this vicinity and have destroyed much property.

Kingsley, Grand Traverse Co., Mich.: on the 9th about 1,800 cords of wood, with other property, consisting of fences, etc., were destroyed by forest fires.

Farwell, Clare Co., Mich.: two logging camps were burned by forest fires on the 9th.

Coleman, Midland Co., Mich.: the Coleman Charcoal Company's kilns, with eight hundred cords of wood, were destroyed on the 9th by fires which originated in neighboring forests.

Jamestown, Chatauqua Co., N. Y.: fires were burning in the pine forest to the south of this place on the 9th.

Detroit, Mich., 10th: reports from Mackinaw Strait state that owing to the prevalence of dense smoke from forest fires, navigation in the strait was rendered difficult.

Sand Beach, Huron Co., Mich.: the village of Sandusky, Sanilac Co., was nearly destroyed by a fire on the 9th which originated in the swamps to the south of that place. Nine buildings were destroyed, entailing a loss of $15,000.

Cheboygan, Cheboygan Co., Mich., 9th: forest fires are again burning in this section, and are destroying much standing timber; fences and barns have been burned.

Cedar Springs, Kent Co., Mich., 9th: no rain has fallen in this section since the middle of June. Extensive forest fires were burning on the above date.

Neillsville, Clark Co., Wis., 9th: a large quantity of cord wood, timber, and other property have been consumed by forest fires in this county.

Belleville, Wayne Co., Mich., 10th: many acres of valuable timber have been destroyed by forest fires to the south of this place.

Fort Wayne, Allen Co., Ind.: the forests adjacent to this place were on fire on the 11th, threatening the destruction of property on neighboring farms.

Caledonia, Ontario, Canada, 11th: a brush fire, covering a tract between three and four miles square, has been burning for the past few days. It is reported that several houses and considerable stock were burned.

Forest and prairie fires are also reported to have occurred as follows:

Mackinaw City, Mich.: 8th, 30th.

Fort Reno, Ind. T.: 14th, 18th, 19th.

METEORS.

Keeler, Inyo Co., Cal.: a brilliant meteor was observed at 10.30 p. m. on the 5th; it appeared in altitude 25°, azimuth 270°, and disappeared in altitude 25°, azimuth 315°. The meteor was visible eight seconds and left a trail of light.

Cairo, Ill.: a brilliant meteoric display was observed in the eastern and southern quadrants and at about altitude 25°, from 9 to 10.30 p. m. on the 10th.

Columbia, S. C.: several brilliant meteors were observed during the night of the 10th, shooting in various direction.

Topeka, Kans.: twenty-seven meteors were observed between 9 and 11.15 p. m. on the 9th, most of which were seen near the "milky way," shooting upward, and leaving trails of light. Between 10 and 11 p. m. on the 10th fifteen meteors were observed; most of these left trails of light, and some of them passed between the observer and a cloud in the northwest, about 60° above the horizon. Between 9 and 11.45 p. m. on the 11th thirty-five meteors were observed; of this number, twenty-eight were accompanied by trails of light, which immediately disappeared; the meteors first appeared near the zenith, with motion south or southwestward; some of the meteors passed between the observer and a stratus cloud.

Mr. A. Wolfe, the light-house keeper at Atlantic City, N. J., reports:

Observed forty-seven meteors between 11 p. m. and 12 midnight on the night of the 10–11th, all moving from east to west; thirty-four between 11 p. m. and 2 a. m. on the night of the 11–12th, moving from east to west and from northeast to southwest; and thirty-five between 11 p. m. and 3.15 a. m. on the night of the 12–13th, moving from northeast to southwest and from north to to south. At 9.10 p. m. on the 24th, observed a meteor which resembled a ball of fire apparently the size of a man's head; it moved from west to east, and separated into two parts before disappearing. Another meteor was seen about the same time, which also exploded when in the zenith.

Meteors were also observed during the month on the follow-dates:

1st, Charleston, Ill. 2d, Fallston, Md. 4th, Vevay, Ind.; Elkin, Ky. 5th, Keeler, Cal.; Kalamazoo, Mich.; Cleburne, Tex. 6th, Keeler, Cal.; Yates Centre, Kans.; Elkin, Ky.; Cleburne, Tex. 7th, Keeler, Cal.; Vevay, Ind.; Kalamazoo, Mich.; Crete, Nebr.; Egg Harbor City, N. J.; Menands, N. Y.; Cleburne, Tex. 8th, Charleston, Ill., Nashua, N. H.; Dover, N. J.; Menands, N. Y.; Cleburne, Tex. 9th, Lead Hill, Ark.; Duke, Fla.; Cairo and Charleston, Ill.; Vevay, Ind.; Bar Harbor, Me., Concord and Nashua, N. H.; Dover and Egg Harbor City, N. J.; Menands, N. Y.; Jacksonborough and Wauseon, Ohio; Indiana, Pa.; Stateburg, S. C.; Cleburne, Tex. 10th, Lead Hill, Ark.; Duke, Fla.; Boisé City, Idaho; Charleston and Windsor, Ill.; Vevay, Ind.; Yates Centre, Kans.; Taunton, Mass.; Lamar, Mo.; Genoa and Tecumseh, Nebr.; Menands, N. Y.; Weldon, N. C.; Jacksonborough, Ohio; Indiana, Pa.; Stateburg, S. C.; Cleburne, Tex.; Variety Mills and Wytheville, Va. 11th, Lead Hill, Ark.; Archer, Fla.; Pekin, Ill.; Kalamazoo, Mich.; Moorhead, Minn.; Tecumseh, Nebr.; Beverly, N. J.; Indiana, Pa.; Columbia and Stateburg, S. C.; Cleburne, Tex.; Wytheville, Va. 12th, Keeler, Cal.; Pekin, Ill.; Taunton, Mass.; Tecumseh, Nebr.; Nashua, N. H.; Beverly, Clayton, Dover, Egg Harbor City, and Readington, N. J.; Jacksonborough, Ohio; Stateburg, S. C.; Brownsville, Tex.; Wytheville, Va. 13th, Yuma, Ariz.; Keeler, Cal., Alva and Cedar Keys, Fla.; Cairo, Ill.; Dudley, Mass.; Kalamazoo, Mich.; Egg Harbor City, N. J.; Jacksonborough, Ohio; Austin, Tenn.; Cleburne, Tex. 14th, Little Rock, Ark.; Keeler, Cal.; Fort Sully, Dak.; Archer, Fla.; Jacksonborough, Ohio; Brownsville, Tex. 15th, Keeler, Cal. 17th, Alva, Fla. 18th, Keeler, Cal.; Limona, Fla.; Nashua, N. H.; Egg Harbor City, N. J.; Cleburne, Tex. 19th, Kalamazoo, Mich.; Egg Harbor City, N. J.; Jacksonborough, Ohio; Brownsville, Tex. 21st, Vevay, Ind., Elkin, Ky.; Jacksonborough, Ohio. 22d, Brownsville, Tex. 23d, Archer, Fla.; Jacksonborough, Ohio. 24th, Webster, Dak. 25th, Beverly, N. J. 28th, Yuma, Ariz. 31st, Muscatine, Iowa; Beverly, N. J.

MIGRATION OF BIRDS.

Geese flying northward.—Fort Custer, Mont., 3d.

SAND STORMS.

Tucson, Ariz.: a very heavy dust and sand storm occurred at 4 p. m. on the 8th, during which the maximum velocity of wind was forty miles per hour; the storm lasted for about one hour.

Sand storms also occurred at the following places: Rio Grande City, Tex., 1st to 4th, 25th; San Carlos, Ariz., 6th; Fort Grant, Ariz., 7th; Fort McDowell, Ariz., 21st, 22d, 26th; Fort Mojave, Ariz., 22d; Yuma, Ariz., 30th.

SUN SPOTS.

Mr. H. D. Gowey, of North Lewisburg, Champaign Co., Ohio, reports having observed sun spots on the following dates: 2d to 10th, 13th, 18th, 19th, 20th.

VERIFICATIONS.

INDICATIONS.

The detailed comparison of the tri-daily indications for August, 1887, with the telegraphic reports for the succeeding thirty-two hours, shows the general average percentage of verifications to be 71.65. The percentages for the different elements are: Weather, 71.18; wind, 70.40; temperature, 72.56. By states, etc., the percentages are: For Maine, 74.81; New Hampshire, 73.16; Vermont, 71.22; Massachusetts, 74.77; Rhode Island, 73.66; Connecticut, 74.26; eastern New York, 75.03; western New York, 69.19; eastern Pennsylvania, 71.49; western Pennsylvania, 73.67; New Jersey, 74.13; Delaware, 68.97; Maryland, 63.69; District of Columbia, 67.72; Virginia, 70.81; North Carolina, 71.69; South Carolina, 72.89; Georgia, 75.06; eastern Florida, 74.27; western Florida, 69.77; Alabama, 71.43; Mississippi, 72.56; Louisiana, 68.96; Texas, 75.00; Arkansas, 78.66; Tennessee, 73.15; Kentucky, 76.16; Ohio, 73.92; West Virginia, 72.76; Indiana, 73.53; Illinois, 68.65; lower Michigan, 72.31; upper Michigan, 66.29; Wisconsin, 67.93; Minnesota, 66.04; Iowa, 68.59; Kansas, 68.10; Nebraska, 66.41; Missouri, 71.39; Colorado, 63.31; eastern Dakota, 62.02.

There were eighteen omissions to predict out of 8,646, or 0.20 per cent. Of the 8,628 predictions that have been made, six hundred and sixty-one, or 7.66 per cent., are considered to have entirely failed; six hundred and fifty-eight, or 7.63 per cent., were one-fourth verified; 1,825, or 21.15 per cent., were one-half verified; 1,606, or 18.61 per cent., were three-fourths verified; 3,878, or 44.95 per cent., were fully verified, so far as can be ascertained from the tri-daily reports.

The predictions during August were made by 1st Lieutenant H. H. C. Dunwoody, 4th Artillery, Acting Signal Officer and Assistant; the verifications were determined by 2d Lieutenant F. M. M. Beall, Signal Corps.

No predictions were made for the Pacific coast during the month.

CAUTIONARY SIGNALS.

Of the total number of signals ordered during August, 1887, it was practicable to determine the justification or failure of twenty-six; all of these were ordered without regard to direction, and fifteen, or 57.70 per cent., were fully justified. Number of signals ordered late, *i. e.*, after justifying velocity had begun, five, or 19.23 per cent.

In addition to the above, there were ordered at display sta-

tions thirty-three signals, the verifications of which it was impracticable to determine.

In fifty-nine instances winds were reported which would have justified the display of cautionary signals, but for which no signals were ordered.

No cold-wave signals were ordered during the month.

LOCAL VERIFICATIONS.

The following is from the report of the "Michigan State Weather Service" for August, 1887:

There are now one hundred and forty stations in Michigan where weather signals are displayed, and seven railroads on which weather signals are carried, there being twenty-five trains leaving terminal points in the morning which carry weather signals.

The percentage of verification of weather signals for August is as follows: (the verification is taken from reports of displaymen furnished this office monthly) temperature, 84.9 per cent.; weather, 82.1 per cent.; temperature and weather, 83.4 per cent.

The percentage of verification of weather predictions for August on the D., G. H., and M. R'y., is 83.3 for weather and 85.2 for temperature; on the C. & G. T. R'y., weather, 86.0, and temperature, 85.7; P. H. & N. R'y., weather, 84.1, and temperature, 85.3.

The following is from the August, 1887, report of the "Minnesota Weather Service:"

Verifications of weather signals for Minnesota were 75 per cent. for weather and 74 per cent. for temperature.

The following is from the August, 1887, report of the "North Carolina Weather Service:"

The percentage of verifications as determined from seven points in the state is as follows: weather, 76.0 per cent.; temperature, 75.9 per cent.

The following is from the August, 1887, report of the "South Carolina Weather Service:"

The percentage of verification of the weather and temperature predictions for the whole state was: for weather, 81.5 per cent.; for temperature, 82.5 per cent.

The following is from the "Tennessee State Board of Health Bulletin" for August, 1887:

The percentage of verification of weather and temperature predictions, furnished daily from the Signal Office at Washington to the various stations in the state during the month, was for the state: weather, 91.4 per cent.; and temperature, 95.5 per cent.

ERRATUM.

In the tornado table on page 167 of the June REVIEW, the date of the tornado at Lead Hill, Ark., given as June 4th, should read May 4th.

STATE WEATHER SERVICES.

The following extracts are republished from reports for August, 1887, of the directors of the various state weather services:

The "Arkansas Weather Service," W. U. Simons, Signal Corps, director:

The first half of the month was very warm, and high temperatures were reported generally. Of these the highest were 110° at Lead Hill on the 11th and 104° at Heber on the 14th. In most other parts of the state the highest temperatures occurred on the 2d to the 5th, and averaged 100° to 104°. The observer at Lead Hill reports the first part of the month hotter than during any previous August in the last six years. The first twenty days of the month covered the heated term. A cool wave passed over the state from the 21st to the 27th, and caused a fall of temperature of from 8° to 20°, and showers of rain in most cases. The average for the month was 79°.4.

The rainfall was very partially distributed, and while the phenomenal amount of 8.28 inches fell in Marion county, which is 3.48 inches above the August average there for the past five years, there were some sections in which none whatever fell. The most general rains fell in the northwestern part of the state, and the least in the southern and southeastern portions. The average for the state was 2.58 inches.

The heaviest rainfalls were 2.15 inches, at Eureka Springs; 2.00 inches, at DeVall's Bluff; 1.94 inches, at Altus; 1.65 inches, at Palarm; 1.80 inches, at Osceola; 1.62 inches, at Lead Hill; 1.50 inches, at Russellville and Dallas. Thunder-storms, with rain, were reported from Eureka Springs, Washington, and Lead Hill the 1st, and lightning and thunder on several other dates from a number of places.

Hail fell at Lead Hill during the storm of the 1st, and again on the 14th, doing considerable damage.

Meteors were observed at Lead Hill on the 9th, 10th, and 11th, and at Eureka Springs and Little Rock on the 10th and 11th, in large numbers and of considerable brightness.

The "Monthly Review of the Illinois Weather Service," Col. Charles F. Mills, director:

The month of August, 1887, was warmer than usual, the mean temperature, 75°, being 1°.5 above the normal for the month. The first half of the month was very hot, the mean temperature of that period, 80°, being over a degree higher than the normal for the same dates in the past thirteen years. The period from 16th to 22d had a normal temperature of about 74°. On the 23d a cool wave swept over the state, resulting in a fall of 13° in the daily mean temperature on the 24th, and minimum temperatures of 40° to 50° in the northern and central divisions of the state. The highest temperatures were reported from 1st to 4th and 9th to 11th, these dates covering the extreme heated periods during the month.

There was an average percentage of sunshine during the month, as compared with the August normal of the past six years, ranging from 55 per cent. in the northern division to 70 per cent. in the southern division.

Heavy rains (3.50 to 6 inches) fell in the extreme northern counties of the state, moderately heavy (2 to 3.50 inches) in the north-central section, and light in the remainder of the state, except in a few counties that received heavy local showers; the average rainfall for the state was 2.50 inches, the northern division receiving an average of 3.50 inches, the central 2.50, and the southern less than 1.50 inches. The heaviest daily rainfalls (about 3 inches) were reported from Stephenson, Putnam, and Henry counties on the 10–11th.

Frost was reported as having occurred on the bottom lands in the north-central section of the state, and six counties in that section reported minimum temperatures of from 40° to 44°.

A violent local storm occurred in Shelby county on August 4th that destroyed everything in its path, twisting off trees fifteen inches in diameter, and moving a large church thirty feet from its foundations. The path of this tornado was from twenty to one hundred yards in width, the accompanying cloud being black and funnel-shaped.

The "Indiana Weather Service," Prof. H. A. Huston, of Purdue University, Lafayette, director:

The pressure for August was slightly below the normal, with only slight fluctuations, and small range. The greatest recorded was at Spiceland, where the barometer read 30.310 on the 31st, and the least at Indianapolis on the 17th, the barometer reading 29.760, the readings in both cases being reduced to sea-level. The greatest range at any station was 0.510, at Vevay.

The temperature was about 2° above the normal. At a great majority of stations the thermometer reached or passed 100° as a maximum. The highest point reached was 104°, at Brookville and Butlerville, on the 4th and 5th, and the lowest, 40°, at Mauzy, on the 29th.

The precipitation was nearly two inches below the normal, which adds to the already large deficiency this year, and increases the damage to standing crops, pastures, etc., and largely diminishes the water supply in many localities. Nor is this deficiency confined to this state and its neighborhood, but prevails over the greater portion of the country—in the south Atlantic states, the Gulf states, the Ohio and Tennessee valleys, the Lake region, and the upper Mississippi valley. It does not follow, however, that the great deficiencies reported in many localities necessarily cause extensive injury to the agricultural interests of the people living there. There is always considerable fluctuation in the rainfall of any section from year to year, and agricultural welfare depends more upon the equitable distribution than in the aggregate amount thereof. A county may, any year, have the average amount of rainfall, and have all usual crops a failure, owing to its irregular distribution. On the other hand the annual amount may fall many inches below the average without any serious damage, if the amount that falls be distributed to the best advantage. In some portions of the western slope the annual rainfall is usually amply sufficient to produce excellent crops, if it fell in proper season; but as it nearly all falls in the winter months, and little or none during the spring and summer, the result is that agricultural operations can not be carried on with any surety of success.

Through Indiana the August rainfall was very irregular, some places getting heavy rains, while places close by got very little. The southern counties got least and the central most. The greatest amount reported was 6.83 inches, at Fortville, and the least, 0.05, at Saint Meinrad's Abbey, and 0.25 at Princeton. Several heavy rains have been reported, running from one to two inches and over. The heaviest was at Fortville on the 17th, 2.21 inches, while at Princeton the observer reports that only 1.50 has fallen in three months.

Auroras were reported at Vevay on the 9th and 23d. Solar halos were reported at Vevay on the 12th and 16th, and at Rockville on the 16th; lunar halos at Vevay on the 11th and 13th, and at Butlerville on the 3d and 6th.

Brilliant meteors were observed at Vevay on the 4th, 7th, 9th, 10th, and 20th.

No frost has been reported during the month, but heavy dews have been reported from various stations.

The "Iowa Weather Service," Dr. Gustavus Hinrichs, Iowa City, director:

August, 1887, averaged normal in temperature, was rather cloudy and with sufficient rainfall except in central Iowa, southerly winds and calms prevailing.

The mean temperature of the air was exactly equal to the twenty years' normal, 71°.2. It was almost the same in 1882, 1871, 1870, 1857, and 1853. But the temperature was very unequally distributed; for the first decade was very hot, being five degrees above normal, and the last decade was quite cool, being five degrees below the normal, while the middle decade of the month was normal in temperature. The notable hot spells fell on the 3d and 4th and 8th to 11th, and were about nine degrees above normal. The cold spell from the 23d to the 28th, being over ten degrees below normal, was more seriously felt by all. The fears of damaging frosts were groundless. Very light hoar frost did form on the morning of the 23d and 24th in northern Iowa (Osceola to Mitchell counties), and extended southward as far Amana, Iowa Co., on the 24th, but it was so light as to do no harm whatever.

In cloudiness the month averaged 30 per cent. above normal; the first decade, only, was bright and hot.

Rain was very frequent in Iowa, on seven days only no rain fell; many of these rains were local and light. More general and abundant rains fell on the 3d, 5th, 10th, 13th, 16–17th, 20th–21st, and 25–26th. Thus from the 3d rains became more extended and pastures turned green again in all but central Iowa. The most extended and copious rains fell on the 10th, 13th, and 20th–21st.

The total rainfall at the central station was 72 per cent. of normal. For the state, it averages nearly three inches, if we except the central and middle-southern portion, from Boone to Linn and down to Wayne county, where the rainfall averages only about half as much. The Missouri slope received the highest, five inches in Adams and Harrison, and over seven inches in Monona county, the highest reported. Along the Mississippi the rainfall is between two and three inches, below Clinton, and increases northward, amounting to five inches at McGregor. In northern Iowa the rainfall generally lies between two and three inches.

For the whole state of Iowa the rainfall has been entirely satisfactory during the month, both in frequency and amount. The increased cloudiness of the last half of the month has greatly enhanced the useful effect of this rainfall. The pastures and meadows of Iowa are again bright green and growing, but wells and brooks are still very low.

Thunder-storms were nearly as numerous as rain storms during the first half of the month, but rare during the last—cold decade. Much damage was done to property and cattle by lightning, and several persons were killed.

High locally-destructive winds accompanied the thunder-storms of the 10th and 13th. Hail is reported only on the 3d in Hancock, and very light on the 8th in Osceola county. Fog was most extended on the 14th and 27th in middle and northeastern Iowa.

No northern lights are reported; solar halos were seen on six days, lunar halos on three days.

The corn crop of Iowa is mature and beyond the reach of harm from frost. The cloudy weather of the last decade protected the corn from serious frosts which continued clear weather would have threatened.

The "Kansas Weather Service," Prof. J. T. Lovewell, Topeka, director:

This month has been characterized by two meteorological periods—one hot and dry, from the 1st to the 14th, during which the temperature ranged near 100°; the second period, extending thence to the end of the month, was the reverse, being cool and damp, and is the period that has saved to Kansas her fall pasturage and winter hay. It was during the second period that not only was the larger part of the rain received, but the rain came down in such gentle, soaking showers that not a drop was lost.

The mean temperature has ranged from 1° to 3° above the normal; the lowest temperatures occurred on the 24th and 25th, and are the lowest since the latter part of May, and the lowest for any August on record at Topeka.

The rainfall has been the encouraging meteorological feature. Except in the southwestern part of the state, where it has been slightly deficient, there has been a decided excess not only of rain, but of moisture in the way of damp air over the state, being the heaviest August rainfall on record at Topeka, and since the establishment of the signal service station at Leavenworth; while at Lawrence but four Augusts have exceeded it for nineteen years.

The close of the month finds all cereal crops made, so as not to be further affected by the weather, save some late planting of corn in the western and northern part of the state, and the usual fall crops, for which all reports show the ground to be in the best possible condition.

The "Michigan Crop Report" (the state weather service is in charge of N. B. Conger, Sergeant, Signal Corps, at Lansing):

The meteorological features of the state are based upon the reports received from forty-six voluntary observers and seven of the United States Signal Service. Several valuable reports were not received this month in time to be used in this report.

The temperature has been about normal. There still exists a deficiency of rainfall, which, however, has been largely reduced this month. No storms of any magnitude have been reported. Light frosts were general during the latter part of the month, but no material damage has been reported.

Atmospheric pressure.—The mean monthly barometer, reduced to sea-level, for August, is 30.00 inches. The maximum pressure occurred on the 30th and 31st, and the minimum on the 17th, over the Upper Peninsula, and on the 22d over the Lower Peninsula. The low area of the 22d was accompanied by general rains, which were heavy in some parts of the state; frosts occurred on the 24th (after the passage of the low area referred to), and were general throughout the northern part of the state.

Temperature.—The temperature for the month has been very near normal, the mean temperature being 0°.8 above the normal. The mean temperature for the Upper Peninsula, 62°.1, is 1°.2 below the normal, while for the Southern Peninsula the mean temperature for the northern section, 63°.7, is 0°.7 below the normal, central section the mean temperature, 67°.4, is 0°.9 above the normal, and the southern section is also 0°.9 above.

The highest mean daily temperature, 78°.1, occurred on the 4th, and the lowest mean daily temperature for the state, 53°.1, occurred on the 26th.

The monthly range of temperature, 81°.5, is high for this month, and a very low temperature of 21°.5, is reported at Gaylord. This record is from tested instruments, yet this seems to be an exceedingly low temperature for the month of August for the latitude.

Light frosts on the low lands were general throughout the north and central portions of the state on the 24th, 25th, and 26th, but no material damage was reported.

Precipitation (in inches).—The drought continued in all portions of the central and southern sections of the state until the 10th, when general rains fell throughout the state; rain occurred on the 11th, 13th, 14th, 15th, 17th, and 18th in southern and central Michigan, and the heaviest rains occurred on the 23d. Big Rapids records 2.64 on the 22d, and Alma, Gratiot Co., reports 2.34 of rain falling in forty-five minutes on the 22d. The average rainfall for August is still below the normal, there being a deficiency of 1.25. Corunna, Shiawassee Co., reports the rainfall to be inappreciable for the month, and the next lowest record is at Gaylord, Otsego Co., where but .09 is recorded. The deficiency for the southern section is 0.92; central section, 0.99; northern section, 2.01 inches, and the Upper Peninsula, 1.68.

The greatest deficiency occurred this month in the northern section, while for July the greatest deficiency occurred in the southern section.

Winds.—The prevailing wind for the month has been northwest. No heavy wind storms have occurred. The maximum velocity reported is thirty-seven miles, west. The average monthly movement is 4,773 miles, this being considerably under the average number of miles of wind recorded for this state.

Summary.

Mean monthly temperature, 66°.5; mean of maximum temperature, 94°.6; mean of minimum temperature, 40°.7; mean monthly range of temperature, 53°.9; highest temperature, 103°, at Three Oaks, on the 3d; lowest temperature, 21°.5, at Gaylord, on the 25th; monthly range of temperature, 81°.5.

Mean monthly rainfall, 1.95 inches.

Prevailing direction of wind, northwest; average monthly movement of wind, 4,773 miles; maximum velocity of wind and direction, 37 miles west, on the 9th, at Mackinaw City.

Average number of clear days, 13.2; average number of fair days, 11.2; average number of cloudy days, 6.6; average number of days on which .01 inch of rain fell, 6.4.

Auroras.—Alma, 24th; Saint Ignace, 24th, 28th; Kalamazoo, 27th; Calumet, 28th, 29th.

Meteors.—Kalamazoo, 5th, 8th, 11th, 13th, 19th; Calumet, 9th, 11th, 27th; Hanover, 11th; Petersburg, 27th.

The "Minnesota Weather Service," Prof. Wm. W. Payne, Carleton College, Northfield, director:

The month was characterized by a temperature below normal, and a deficiency of precipitation except over a small area in the southeastern portion of the state. From the 1st to the 14th there was an excess of precipitation and temperature; for the week ending the 20th the temperature and precipitation were deficient; from the 21st to the close of the month the temperature was below the average and rainfall slightly deficient. The first frosts of the season, which occurred generally over the state on the mornings of the 24th and 25th, did no serious injury to grain, but tender vegetables were in many instances nipped. Toward the close of the month the rainy weather retarded threshing in the southern portion of the state, but improved the pastures, although too late to materially benefit corn.

Temperature.—During the early portion of the month it was slightly above normal, while toward the close it fell considerably below. The mean for the state is 65°.3, this is 2°.2 above that for the corresponding month of 1885, and 4°.7 below that of 1886. At stations taking observations for a number of years the mean is about 3° below the average. The mean of the maximum temperatures is respectively 6° above and 5° below that of 1885 and 1886; the minimum temperatures are about the average. The warmer periods of the month were the 1st to the 12th (inclusive), 16th, 17th, 21st, 28th to 31st; the highest temperatures for the month occurred during the first of these periods. The maximum was 101° and registered at Spring Valley on the 10th; this is 3° below that for 1886; the next highest was 96° and registered on the 2d at Sherburne, La Crosse, and Grand Meadow. In August, 1886, the maximum at Saint Vincent and Grand Forks was 103°, while for this month it was only 88° and 86°, respectively. The cooler terms were the 18th and 22d to 28th; on these days the mean daily temperatures were generally below 60°, while the minimum temperatures were below 40°. Some of the lowest reported were: Tracy, 22°, 25th; Saint Vincent, 29°, 25th; Pokegama Falls Dam and Park Rapids, 30°, 25th; Morris, 33°, 24th; Spring Valley, 34°, 25th. The greatest monthly ranges of temperature were generally in the southern counties, Spring Valley and Tracy reporting the maximum ranges, 67° and 69°,

respectively. The north-central counties report the least ranges, that at Lake Winnibigoshish Dam being 37°, and Brainerd, 42°. The monthly range of temperature for the state is 79°; this is 6° more than that for the same month last year.

Precipitation (in inches).—The average for the state is 3.04; this is about half an inch above that of the corresponding month of 1885 and 1886. Rain was frequent and quiet general, although many local showers occurred throughout the state, causing the stations in Goodhue and Olmstead, and the counties northwestward to Wright and Meeker, to report an excess of precipitation, while other stations generally reported a deficiency. The least amounts, which were generally below two inches, were reported from the northern portion of the state. Brainerd recorded a fall of only 0.87, while Park Rapids and Grand Forks reported 1.25. At Duluth the deficiency is 1.71; La Crosse, 1.36; Moorhead, 1.23; Saint Vincent, 1.09; Saint Paul, 0.29. The heaviest monthly rainfalls were: Delano, 7.00; Red Wing, 6.70; Excelsior, 6.10; Litchfield, 5.18; Rochester, 5.09. Rain was of frequent occurrence throughout the state on the 2d, 3d, 7th to 10th, 12th to 14th, 19th, 21st, 22d, 26th, 28th, 30th, 31st. Stations reporting over an inch of precipitation, with amounts and dates, are: Pokegama Falls, 1.20, 22d; Pine River Dam, 1.20, 21st; Morris, 2.53, 10th, 2.08, 13th, and 1.79, 31st; Litchfield, 1.85, 9th, and 1.80, 13th; Delano, 1.50, 13th; Saint Paul, 1.08, 13th; Excelsior, 2.67, 14th, and 1.00, 31st; Red Wing, 1.51, 10th, and 2.78, 13th; Northfield, 1.19, 10th, and 2.20, 13th; Mankato, 1.60, 13th; Rochester, 1.50, 14th; Rolling Green, 1.20, 8th; Spring Valley, 1.50, 13th; Albert Lea, 1.96, 13th; Grand Meadow, 1.36, 13th; Princeton, 1.50, 22d. Owing to the great frequency of rain and the prevailing cloudiness the relative humidity was somewhat higher than usual. The mean for the state is 77 per cent.; this is higher than that for the same months of the two preceding years.

Winds.—The prevailing direction was from the southwest.

Lunar halos were observed at Rolling Green, 29th; Tracy, 6th; Brainerd, 6th and 30th; Park Rapids, 31st; Saint Vincent, 28th and 31st. Solar halos were observed at La Crosse, 8th and 12th.

Sleet fell at Glenwood, 30th and 31st. Hail was reported to have fallen at Red Wing, 2d; Sherburne, 8th; Rolling Green, 9th; Lake Winnibigoshish Dam, 1st, 12.30 a. m., and during night of 10th; Northfield, 31st.

The "Mississippi Weather Service," Prof. R. B. Fulton, of the University of Mississippi, Oxford, director:

Summary.

Mean temperature, 81°. The highest, 103°, and the lowest, 50°, occurred at Meridian. Absolute range of temperature, 53°. Greatest monthly rainfall, 7.83 inches at Edwards. Least monthly rainfall, 0.06 inch at Corinth. Average depth of rainfall, 2.69 inches. Average number of days on which rain fell, 5.5.

The rainfall for the first eight months of the year has been peculiar in several respects. The mean rainfall for the state during these months was 28 inches; about 15 inches less than the normal amount. Every month showed decidedly less than the normal except June, which showed a slight excess. The rains during these months were generally light, but tolerably well distributed as to time. The deficiency of rain during the past month has been unfavorable to the cotton crop; and it has been damaged considerably, principally in the bottom lands, by the army worm.

The rainfall was greatest in the southern and western portions of the state, and least in the northeastern portion.

The following heavy rainfalls (one inch or more) were reported: 1.10 inches at Hermanville on the 6th; 1.12 inches at Loch Leven on the 18th; 1.00 inch at Lake on the 10th; 1.21 inches at Greenville on the 6th; 1.00 inch at Jackson on the 18th; 1.58 inches at Vicksburg on the 5th; 1.95 inches at Edwards on the 18th.

Biloxi: meteors were noticed in great numbers on the evenings of the 10th and 11th.

Palo Alto: we had very light rains here on the 1st, 5th, 6th, 7th, and 8th; since then not a drop has fallen. A terrible drought is prevailing. Stock is suffering very much in some localities for water. Late corn is ruined; cotton badly injured. Sweet potatoes will be almost a complete failure. No turnips have been sowed up to this date, and the gardens are completely burned up.

The "Nebraska Weather Service," Prof. Goodwin D. Swezey, of Doane College, Crete, director:

August has been a month of extremes of temperature, but on the whole cool, and the rainfall, unusual for August, has left the ground in excellent condition for fall plowing and for the recovery of vegetation from the unprecedented continuance of dry weather.

Precipitation.—The area of the state receiving the greatest rainfall extends from the centre of the state, northeasterly and easterly, including most of the Elkhorn Valley, and extending down that river southeasterly to near its mouth; this area has received over five inches, or about two inches more than the normal for August. The greater part of the state has received from three to five inches, with a gradual falling off towards the southeast and the north, where two localities, viz., the middle region of the Niobrara Valley, and that stretching from Lincoln toward Weeping Water, and southeast towards Nebraska City, have received less than three inches; almost the entire state has received more than the normal August rainfall.

Temperature.—The month has had both the hottest and the coolest days of any August for ten years; the highest temperature registered was 101°.5, at Omaha, and the lowest, 38°, at Valentine; 100° was registered in August, 1881, and 40° in August of last year. The mean temperature has been 70°.9, about three degrees below the normal; the number of days above 85° has been thirteen, which is about the usual number.

Storms.—The extremes of temperature have been accompanied by numerous storms; both the hail and thunder-storms have been unusually numerous although not severe. No great damage from them has been reported from any part of the state.

The "New England Meteorological Society," Prof. Wm. H. Niles, of the Institute of Technology, Boston, Massachusetts, president:

Reports for the month were received from one hundred and forty-three observers.

August has had an excess of rainy and cool weather. The excess of rain occurred chiefly in the central districts, and may be, in most part, ascribed to the storm of the 18th; the low temperature was general as a result of a good share of cloudy weather and of frequent northerly winds on clear days.

Mr. J. B. Hall makes the following comparison of the rainfall of August at Worcester with the same in other Augusts, whose rain was more than double its normal quantity: 1852, 11.38; 1853, 10.71; 1856, 13.14; 1867, 10.79; 1887, 10.29.

At Holden, near Worcester, the fall was 9.95. Half of these large totals fell on the 18th, when the amounts collected were 5.25 and 4.85 inches, respectively.

Hon. W. L. Foster reports that this was the coldest August at Concord, N. H., for nineteen years; and the rainfall of the three summer months was 20.08 inches, being 2.79 in excess of the greatest summer rainfall in the last thirty-two years.

The month has shown eleven rather well-marked weather-periods of different lengths, characterized by changes from fair to rainy weather in accordance with general changes of atmospheric pressure. The most distinct of these were the fine cool days, beginning on the 7th, 13th, and 27th, and the rains on the 18th and from the 22d to the 25th.

The "New Jersey Weather Service," Prof. George H. Cook, of the Agricultural College, New Brunswick, director:

The nights of the month just closed, like those of August, 1886, were, with few exceptions, cool and pleasant, and it is worthy of remark that there was a difference of only two hundredths of a degree between the mean temperature of the nights of the one and that of the nights of the other. In fact there was, in the final result, but a trifling difference between the temperature of the former and that of the latter, the mean of August, 1886, having been 73°.3, and that of the last month, 73°.1.

The precipitation for August, 3.23 inches, was considerably less than the average, 5.11 inches, for the past forty-four years. Rain fell on six days, more than one-half of it falling on the 22d, attended by the most terrific thunder and lightning.

The "North Carolina Weather Service," Dr. Herbert Battle, of Raleigh, director:

Temperature.—Mean for August, 1887, 75°.4; normal for August, 76°.5; departure from the normal, —1°.1; highest observed, 99°.8, occurred at Oxford, N. C., on the 12th; lowest observed, 46°.0, occurred at Marion, N. C., on the 31st; highest on record, 103°.0, occurred in 1881 at Cape Henry, Va.; lowest on record, 46°.0, occurred in 1887 at Marion, N. C.; monthly range of temperature, 53°.8; mean daily range of temperature, 15°.9; warmest day, 7°.7 above the normal; coldest day, 16°.2 below the normal.

Precipitation (in inches).—Average for August, 1887, 8.85; normal for August, 5.61; departure from the normal, +3.24; greatest local daily rainfall, 9.00, at Tarborough, N. C., on the 3d; greatest monthly rainfall, 22.73, at Tarborough, N. C.; least monthly rainfall, 3.13, at Chattanooga, Tenn.

Winds.—Prevailing direction for August, 1887, northeast; average direction for August, northeast; highest velocity, eighty-two miles southeast, on the 20th, at Hatteras, N. C.

Weather.—Average number of clear days, 10.4; average number of fair days, 13.6; average number of cloudy days, 7.0; average number of rainy days, 13.6.

Droughts.—Longest duration of: at Reidsville, N. C., 11th to 15th, 5 days; Weldon, N. C., 7th to 12th, 6 days; Oxford, N. C., 9th to 12th, 4 days; Monroe, N. C., 9th to 12th, 4 days; Waynesville, N. C., 4th to 13th, 10 days; Mount Pleasant, N. C., 9th to 12th, 4 days; Salisbury, N. C., 28th to 31st, 4 days; Marion, N. C., 28th to 31st, 4 days; Tarborough, N. C., 9th to 14th, 6 days; Lynchburg, Va., 3d to 11th, 9 days; Wilmington, N. C., 9th to 12th, 4 days; Charlotte, N. C., 9th to 12th, 4 days; Chattanooga, Tenn., 9th to 14th, 6 days; Knoxville, Tenn., 7th to 12th, 6 days; Southport, N. C., 9th to 15th, 7 days; Norfolk, Va., 8th to 12th, 5 days; Hatteras, N. C., 8th to 14th, 7 days; Raleigh, N. C., 9th to 13th, 5 days.

The "Ohio Meteorological Bureau," Prof. B. F. Thomas, of the Ohio State University, Columbus, president:

The month opened warm, with maximum temperatures ranging from 90° to over 100° from the 1st to the 5th. General rain occurred over the state on the 1st, and heavy local rains in the northern and southern portions on the 2d; general rain occurred again on the 4th, 5th, and 6th in advance of a slight cool wave that came in then and lasted until the 8th. This was followed by warmer, fair weather until the 12th, when another cool area (preceded by

heavy local rains in the northern and central portions on the 11th, and general rain on the 12th) came in and lasted until the 31st, being intensified and producing light frosts at various points in the northern portion of the state from the 25th to the 31st. The weather accompanying this cool condition was unsettled until the 22d, when it settled down into a long spell of clear skies and dryness that lasted late into the following month.

The month furnished also the greatest extremes in temperature of any August since the opening of the bureau, the highest recorded being 104°, on the 4th and 10th, at Pomeroy, and the lowest, 33°, on the 29th, at Paulding, giving a range of 71°, or 11° greater than any preceding August, and furnishing the extremes of high and low temperatures recorded since 1882.

The number of clear and fair days was less, while the cloudy days exceeded the average.

The total mean monthly rainfall for the state was 2.39 inches, being 0.74 inch less than the average for the five years past, the greatest mean rainfall being recorded in the northern, and the least in the southern portions, being nearly four inches greater in the former than in the latter section.

The barometric pressure remained remarkably even during the month, the highest reading recorded, 30.331 inches, being on the 31st, at Akron, and the lowest, 29.645 inches, on the 17th, at the Ohio State University. The mean pressure, 29.990 inches, departed only .017 inch from the normal for the five years.

The mean temperature for the state, 70°.9, was exactly the same as last August, but exceeded the mean for the five years by one degree. The mean for the northern section was 68°.9; for the middle, 70°.9, and for the southern, 73°.4.

The first frost of the season occurred on the 25th, and again on the 28th, 29th, and 30th, in the northern portion of the state.

Mean daily range of temperature, 25°.9; greatest daily range of temperature, 54°, on the 8th, at Paulding; least daily range of temperature, 5°, on the 17th, at New Bremen.

Average number of clear days, 12.9.

Average number of fair days, 11.6.

Average number of cloudy days, 6.5.

Average number of days on which rain fell, 8.3.

Greatest number of days on which rain fell, 13, at Cleveland; least number of days on which fell, 4, at Hanging Rock, New Comerstown, and Wooster; mean monthly rainfall, 2.39 inches; average daily rainfall, 0.076 inch.

Prevailing direction of wind, northeast.

"Oregon Weather Service," report prepared by B. S. Pague, Private, Signal Corps:

The temperature was from 0°.5 to 2° below the normal. The range being small; generally cool nights and warm afternoons. It was highest in the northeastern part of the state, and lowest in the mountain region of the south. From the 5th to the 11th was a warm period; the other days of the month being cool.

The rainfall was below the normal, except at Ashland and Linkville, where it was above the normal. A few sprinkles fell in the interior valleys and along the coast; in the eastern part of the state the rainfall was principally from a thunder storm which occurred on the 11th. The rainfall of the season to date is below the normal in all districts, except at Linkville.

The "South Carolina Weather Service," Hon. A. P. Butler, Commissioner of Agriculture for South Carolina, director:

In the Piedmont section of the state and in the counties of Chesterfield and Marlborough the rainfall during the month of August was above the average, while in the lower counties it was less than the average. At Charleston the rainfall for the month was 4.12 inches, or 3.72 inches less than the average of the last sixteen years.

The mean temperature was slightly below the average.

Summary.

Mean temperature, 77°.8; highest temperature, 101°, at Chester, on the 13th; lowest temperature, 49°, at Spartanburg, on the 31st; range of temperature, 52°; monthly range of temperature, 39°.3; greatest daily range of temperature, 33°, at Jacksonborough, on the 14th; least daily range of temperature, 2°, at Chester and Winnsborough, on the 8th.

Mean depth of rainfall, 6.54 inches; greatest monthly rainfall, 13.70 inches, at Brewer Mines, Chesterfield Co.; least monthly rainfall, 1.27 inches, at Branchville, Orangeburg Co.; greatest daily rainfall, 4.30 inches, at Evergreen, Anderson Co., on the 8th; least daily rainfall, trace (amount inappreciable), at several stations, on the 16th; average number of rainy days, 11.4. The heaviest rains of the month occurred on the 7th, 8th, and 27th, those on the latter date being unusually heavy in the northern and northwestern counties of the state.

Hail storms.—Hail storms, causing some damage to crops, occurred on the 16th near Winnsborough, and on the 17th near Broad River, in the vicinity of Lyles Ford. On the 17th a severe hail storm passed down South Tiger River from Duncan's, about fifteen miles from Spartanburg. It started near Cohen's Mill, passed Gowensville, and ended near Walnut Grove, destroying all corn, cotton, peas, etc., in its path.

Local storms.—On the 18th a wind storm at and near Winnsborough unroofed a house and blew down timber.

Optical phenomena.—Solar halos were observed at Stateburg on the 1st and 30th. Lunar halos were observed at Stateburg on the 1st, 2d, and 3d; at Spartanburg on the 4th, and at Columbia on the 1st and 30th.

Meteors.—On the 10th, at Columbia, several meteors were observed, moving in different directions, east to west predominating. On the 11th several were observed between 9 and 10 p. m., their general direction of movement being from northwest to southeast. On the 9th, at Stateburg, at 9.30 p. m., a bright meteor was observed midway between the North Star and the zenith; it moved northeast and disappeared in Cassiopeia. On the 10th, at 9.05 p. m., moving south-southwest, from near the zenith to head of Scorpio; also at 12.30 a. m., moving in a northerly course. On the 11th, between 9 and 10 p. m., three bright meteors, two moving from southeast to southwest, and one from northeast to northwest. On the 12th, one in east-northeast, course north to south. On the 10th, at 11 p. m., at Brewer Mines, Chesterfield Co.

Floods.—The heavy rains which occurred at the close of July, together with those on the opening days of August, caused high water in several of the streams of the state, notably the Savannah, Santee, Wateree, Congaree, and Broad Rivers and their tributary creeks. These rivers were all out of their banks at various points and caused considerable damage to the contiguous farming lands, submerging, and in many instances totally destroying, the growing crops. Bottom-land farmers on the Savannah River were the heaviest sufferers, while the rice plantations on the Santee were also considerably damaged.

The following is an extract from the report of the "Meteorological Department of the State (Tennessee) Board of Health," prepared under direction of J. D. Plunkett, M. D., President of the State Board of Health, by H. C. Bate, Signal Corps, Assistant, Nashville:

The feature for August was the abnormally high temperature during the first and second decades; otherwise there was but little departure from the normal.

The mean temperature was 76°.7, the highest August mean during the past five years. The highest temperature was 103°, recorded on the 3d, at Austin, Wilson Co., and the next highest was 102°, recorded on the 3d, 12th, and 14th, at Milan, Gibson Co. A maximum of 101° was recorded at Riddleton, Smith Co., on the 15th; at Savannah, Hardin Co., on the 2d; and at Hohenwald, Lewis Co., on the 2d, 3d, and 5th. The lowest temperature was 48°, recorded on the 25th, 29th, and 31st. The monthly range of temperature was slightly in excess of the normal, as was also the mean daily range. During the last decade a period of low temperature prevailed.

The mean precipitation was 3.07 inches, which was about an inch less than the August mean of last year, and about that amount more than the August means of the two preceding years. Of this amount, the eastern division received an average of three and three-fourths inches, and the middle and western divisions about two and three-fourths inches. The rains were mostly light and local in character. Those of the 5th, 15th, 17th, and 26th, however, were general, the last-named being the heaviest fall during the month. The greatest monthly rainfall was 6.43 inches, at Rogersville, and the least was only 1.21 inches, at Memphis, the smallest August rainfall at that station since 1872, when only 0.54 of an inch was reported. The greatest local daily rainfall occurred at Milan, on the 19th, when 2.96 inches fell. This was strictly a local rain, as no other observer in the state reported rain on that day except at Knoxville, and that inappreciable. The observer at Milan reports 5.10 inches of rain at his station during three days—the 19th, 20th, and 21st. Several of the rains (that of the 26th excepted) were attended by the usual electrical disturbances. There were eight days on which no measurable rain fell.

Dews were reported on about fifteen days.

Meteors were observed as follows: Riddleton, 24th, very large and brilliant, appearing 60° above southeast horizon, course west, leaving bright path behind. Just before disappearing—at 45° west, 7.45 p. m.—it gave off particles like a rocket, motion slow; Nashville, 10th to 12th, numerous, mostly small ones appearing in north and northeast, general direction southwest, space 10° to 30°; Trenton, 6th, 8 p. m., southeast, course southwest 30°, disappeared 20° above southwest horizon.

Summary.

Range of temperature, 55°; mean monthly range of temperature, 40°.7; greatest monthly range of temperature, 53°, at Hohenwald; least monthly range of temperature, 34°, at Covington; mean daily range of temperature, 17°.6; greatest daily range of temperature, 38°, on the 25th, at Hohenwald; least daily range of temperature, 2°, on the 17th, at Careyville, and on the 26th, at Rogersville and Waynesborough; mean of maximum temperatures, 97°.2; mean of minimum temperatures, 56°.5.

Mean daily rainfall, 0.099 inch; greatest rainfall, 6.43 inches, at Rogersville; least rainfall, 1.21 inches, at Memphis; greatest local daily rainfall, 2.96 inches, on the 19th, at Milan; days of greatest rainfall, 5th, 15th, 17th, 26th; day of greatest rainfall, 26th; days without rainfall, 9th, 10th, 11th, 12th, 28th, 29th, 30th, 31st.

Average number of days on which rain fell, 7.

Average number of clear days, 15.7.

Average number of fair days, 11.

Average number of cloudy days, 4.3.

Warmest day, 3d; coldest days, 25th, 31st.

Prevailing direction of wind, northeast.

NOTES AND EXTRACTS.

Mr. W. G. Blake, of Spartanburg, S. C., furnishes the following report of observations taken by him on the thermal belt in Polk county, N. C.:

I erected three stations, No. 1 in the valley, No. 2 on the belt, and No. 3 on the mountain above the belt. Each station contained a maximum, minimum, and wet-bulb thermometer, the instruments being placed four feet above the grass and subjected as nearly as possible to the same conditions. During the day the instruments were protected from the sun by being covered with large white boxes, well ventilated. On Wednesday evening, August 17th, there came up a heavy thunder-storm, lasting about one-half hour. During the night the sky was partly clouded, the wind and clouds coming from the southwest. On Thursday morning the minimum thermometer read:

At station No. 1, 66°.3; at station No. 2, 66°.3.

I was not able to obtain a reading at station No. 3. On same day at 12 m., the thermometer read:

At station No. 1, dry bulb, 76°.0; wet bulb, 74°.0. At station No. 2, dry bulb, 74°.5; wet bulb, 72°.0.

It was raining during this observation and continued showery all day. On Friday night, August 19th, simultaneous observations were made at stations No. 1 and No. 2, every half hour from 9 p. m. until 12 p. m. The readings are:

Station No. 1.			Station No. 2.		
Time.	Dry bulb.	Wet bulb.	Time.	Dry bulb.	Wet bulb.
	°	°		°	°
9.00 p. m.	71.3	70.1	9.00 p. m.	70.3	69.0
9.30 p. m.	69.5	69.1	9.30 p. m.	68.3	67.3
10.00 p. m.	69.0	68.9	10.00 p. m.	69.0	68.0
10.30 p. m.	70.0	69.5	10.30 p. m.	70 3	68.9
11.00 p. m.	70.0	69.6	11.00 p. m.	70.3	69.0
11.30 p. m.	70.4	70.1	11.30 p. m.	70.5	69.2
12.00 p. m.	70.0	69.9	12.00 p. m.	71.0	69.0

At both stations the minimum thermometer on Saturday morning read 68°.4. The sky was alternately clear and cloudy while these observations were taken.

These results show very little difference between the temperature and humidity in the valley and in the thermal belt, though I am sure had the weather been clear and dry, a much greater difference would have been observed.

A Mr. Wilcox, an intelligent gentleman, living at the foot of the mountain, states that he has noted in the winter a difference of 20° in temperature between the belt and the valley. Indeed, it is now very easy to note the advanced stage of vegetation upon the belt; for instance, the fruit of the passion flower was ripe, even rotting, high up on the sides of the mountain, while in the valley and even here at Spartanburg, thirty miles further south, the plant is only in bloom, or has small and green fruit.

With reference to chart number v (meteorological and health chart for Ohio, August, 1887), accompanying this issue of the REVIEW, the following communication from its author is given:

MOUNT VERNON, OHIO, *October* 7, 1887.

General A. W. GREELY,
Chief Signal Officer, U. S. A.:

DEAR SIR: Some weeks ago I requested of you, for special purposes, the following publications of your office: Professional Papers of the Signal Service, XIII, XVII, and XVIII; the best form of electrometer, collector, batteries, etc., according to results of late investigations under your supervision.

* * * * * *

It may be of some slight interest to you to know the line of my work, so I enclose, herewith, a chart such as I am making for each month, the same being furnished the State Board of Health, to become a part of its annual report. I wish to complete this chart in the course of time, by adding curves for *atmospheric electricity* and *ozone*. Therefore the records and work of your office will become of great value to me, if they are available.

I have the honor to be, sir, your obedient servant,

E. R. EGGLESTON, M. D.

Meteorological record of voluntary observers and Army post surgeons' August, 1887.

The maximum and minimum temperatures at stations marked thus (*) are from readings of other than standard instruments.

Stations.	Temperature. (Fahrenheit.) Maximum.	Minimum.	Mean.	Precipitation.
Alabama.	°	°	°	*Inches*
Livingston	97	63	79.4	3.45
Mount Vernon B'ks.	98	61	82.3	0.58
Arizona.				
McDowell, Fort	115	63	91.6	1.52
Mojave, Fort	115	37	90.0	1.62
Tucson	.....	.....	.....	1.25
Arkansas.				
Hot Springs	98	60	79.0	1.56
Lead Hill	110	54	78.0	8.38
British Columbia.				
New Westminster	.....	.....	.....	0.74
California.				
Alcatraz Island	66	49	54.4	0.00
Anderson*	102	50	72.5	0.00
Angel Island	81	50	75.7	0.00
Benicia Barracks	93	53	65.1	0.00
Bidwell, Fort	94	35	68.5	0.22
Cahuenga	.....	.....	.....	0.40
Fall Brook*	98	53	67.1	0.00
Gaston, Fort	106	40	69.3	0.00
Lewis Creek *	105	38	82.2	0.00
Mason, Fort	70	53	57.9	0.00
Nicolaus *	99	52	72.4	trace.
Oakland	79	51	58.5	0.00
Oroville*	97	54	76.2	0.01
Poway *	96	58	68.6	trace.
Presidio of San F	72	45	56.8	0.00
Sacramento	96	47	66.2	trace.
Salinas	70	53	56.9	0.00
Santa Barbara*	81	53	64.8	0.00
Willows	108	52	76.9	trace.
Colorado.				
Grand Junction *	96	52	72.0	1.48
Lewis, Fort	88	21	62.9	2.60
Connecticut.				
Hartford	93	46	66.1	7.93
North Colebrook *	83	40	62.5	4.42
Voluntown*	88	56	.....	3.29
Dakota.				
Abr. Lincoln, Fort	90	38	66.0	1.84
Henry *	80	37	63.7	2.81
Meade, Fort	98	41	65.0	4.25
Parkston*	92	41	70.0	10.84
Pembina, Fort	88	31	60.3	0.86
Randall, Fort	100	27	68.2	3.49
Richardton*	84	43	63.8	2.93
Sisseton, Fort	88	33	58.4	8.07
Sully, Fort	97	48	69.0	1.04
Totten, Fort	87	34	64.0	2.41
Webster	89	30	64.3	2.27
Yates, Fort	95	47	69.5	1.03
District of Columbia.				
Distributing resv'r*	96	52	75.6	1.76
Receiving reservoir *	96	54	76.1	1.57
Wash. Aqued't Offi.*	98	59	78.5	.....
Florida.				
Alva *	95	73	79.1	6.66
Archer *	95	65	79.8	8.37
Duke	94	67	78.9	3.29
Fort Meade*	94	78	86.0	4.25
Homeland *	95	72	82.6	3.25
Limona *	94	74	83.0	11.17
Manatee*	96	79	83.8	6.18
Merritt's Island	95	68	81.0	6.06
St. Augustine, Fort.	92	68	78.4	7.25
Georgia.				
Athens	91	55	74.5	7.84
Forsyth*	98	62	80.3	5.42
Milledgeville*	93	60	78.9	3.86
Idaho.				
Boisé Barracks	98	45	75.3	0.24
Lewiston	103	56	.....	0.54
Sherman, Fort	94	41	65.6	1.50
Illinois.				
Collinsville	102	48	74.7	0.84
Charleston*	106	48	76.2	2.30
Geneseo *	100	51	75.6	4.74
Mattoon	104	51	74.0	3.23
Pekin *	104	47	73.0	3.77
Peoria	104	52	76.7	2.72
Riley	98	44	68.1	4.85
Rockford	97	50	69.7	4.42
Sandwich *	102	50	73.3	3.97
South Evanston *	100	47	.....	2.67
Sycamore	101	42	68.8	3.61
Windsor	102	48	74.5	2.13
Indiana.				
Butlerville *	104	57	77.0	1.95
Jeffersonville	99	52	77.0	2.72
Indiana—Con.				
Laconia	105	52	76.7	0.82
Logansport*	103	47	73.3	3.25
Lafayette	102	47	72.2	3.08
Manzy	98	40	69.8	1.50
Sunman*	100	48	74.9	2.05
Vevay	101	46	76.2	2.02
Indian Territory.				
Gibson, Fort	106	56	80.2	2.78
Reno, Fort	106	52	80.4	1.90
Supply, Fort	104	55	76.4	2.98
Iowa.				
Bancroft *	95	38	67.6	3.23
Cresco	99	45	69.0	2.23
Cedar Rapids*	98	42	72.4	1.40
Clinton	102	41	70.1	3.84
Des Moines	102	43	71.5	.....
Fort Madison	100	47	.....	3.57
Humboldt	100	34	66.9	1.24
Independence *	90	50	69.4	2.71
Logan *	103	46	73.5	4.60
Monticello *	100	38	69.8	3.31
Mount Vernon *	102	52	74.3	2.62
Muscatine	102	40	71.8	2.40
Oskaloosa *a*	99	46	74.3	0.64
Oskaloosa *b* *	102	56	.....	.....
Kansas.				
Allison	108	41	.....	5.08
East Norway *	101	55	76.0	8.40
Elk Falls	.....	.....	.....	4.68
El Dorado	101	53	76.8	2.30
Emporia	96	54	77.8	3.92
Globe *	100	54	75.5	3.17
Hays, Fort	103	41	74.5	4.64
Independence	111	54	77.6	3.60
Lawrence	99	49	73.6	4.88
Manhattan	101	52	74.0	6.58
Morse*	98	54	76.0	6.50
Ninnescah*	.....	.....	.....	4.76
Riley, Fort	102	50	75.7	5.12
Salinas *	102	56	.....	6.60
Wellington	105	52	77.3	5.07
Wakefield *	104	55	75.4	6.89
West Leavenworth*	100	50	.....	11.30?
Yates Centre	102	48	73.6	2.19
Kentucky.				
Bowling Green*	100	59	.....	1.99
Harper's Ferry*	96	62	78.7	0.78
Frankfort*	103	44	76 5	2.66
Louisiana.				
Grand Coteau	93	67	80.9	1.88
Liberty Hill*	92	.....	.....	3.27
Maine.				
Bar Harbor	83	47	.....	6.61
Cornish	87	50	64.0	2.52
Gardiner *	81	46	63.2	3.42
Orono *	84	45	63.4	4.60
Skowhegan	80	43	62.2	3.15
Maryland.				
Cumberland	88	48	70.2	1.12
Fallston	87	52	70.0	5.99
Great Falls*	98	50	75.0	2.38
McDonogh	90	53	71.4	3.34
McHenry, Fort	89	56	73.9	5.63
New Midway *	90	45	71.9	2.74
Woodstock	89	45	70.0	4.00
Massachusetts.				
Amherst	88	42	64.9	7.75
Blue Hill Observ'y *a*	83	47	64.1	3.07
Blue Hill Observ'y *b*	84	48	.....	3.89
Deerfield	88	42	65.0	6.54
Dudley	93	41	67.8	3.45
Fall River	87	49	66.3	3.75
Heath*	90	42	.....	.....
Milton	85	49	64.1	3.83
New Bedford	80	49	66.5	6.61
North Truro	.....	.....	.....	6.38
Somerset	90	48	70.4	4.61
Taunton	90	47	66.4	5.15
Westborough*	95	46	67.4	5.94
Williamstown	83	42	63.5	7.03
Michigan.				
Brady, Fort	86	38	61.9	0.54
Harrisville *	90	38	64.3	2.35
Hudson	100	38	.....	2.34
Kalamazoo	92	53	72.5	1.09
Lansing	93	39	67.1	0.93
Marshall *	94	53	.....	2.59
Mottville *	95	46	.....	2.58
Swartz Creek	98	37	66.2	2.79
Thornville *	96	43	67.8	3.11

Meteorological record of voluntary observers, etc.—Continued.

Stations.	Temperature. (Fahrenheit.) Maximum.	Minimum.	Mean.	Precipitation.
Michigan—Con.	°	°	°	*Inches*
Traverse City	94	38	65.6	.....
Minnesota.				
Minneapolis*	92	45	66.0	4.17
Snelling, Fort	96	37	68.0	5.10
Missouri.				
Conception	98	53	73.6	3.87
Fayette*	103	42	77.0	0.49
Montana.				
Keogh, Fort	100	41	72.1	2.30
Missoula, Fort	90	44	65.0	1.14
Shaw, Fort	91	40	64.4	0.00
Nebraska.				
Brownville *	104	52	76.6	3.74
Crete*	101	46	72.3	3.75
De Soto *	103	48	72.1	3.36
Fremont*	100	51	71.2	3.57
Genoa	95	46	70.6	4.48
Hay Springs	98	44	64.8	3.14
Marquette*	.....	.....	.....	2.63
Niobrara, Fort	99	47	67.7	2.46
Robinson, Fort	97	45	68.3	3.32
Sidney, Fort	96	30	68.7	3.74
Tecumseh *	99	53	.....	4.25
Nevada.				
Carson City	93	33	67.2	0.00
McDermit, Fort	92	33	68.1	0.18
New Hampshire.				
Antrim	.....	.....	.....	8.83
Ashland	.....	.....	.....	4.13
Belmont	.....	.....	.....	6.52
Berlin Mills	89	33	.....	2.32
Bristol	.....	.....	.....	3.38
Concord	86	46	66.2	7.78
Lake Village	.....	.....	.....	4.28
Nashua	88	42	65.5	5.30
Wier's Bridge	.....	.....	.....	3.69
Wolfeborough	.....	.....	.....	4.40
Woodstock	.....	.....	.....	4.83
New Jersey.				
Beverly	88	55	71.2	2.86
Clayton *	91	50	71.5	3.15
Dover	90	43	64.9	3.20
Egg Harbor City	91	46	69.7	2.60
Moorestown	86	50	70.3	3.17
Readington*	88	54	73.6	.....
Roseland *	89	42	.....	3.97
Salem*	94	55	71.8	.....
South Orange	90	55	68.9	6.38
Vineland	89	50	74.2	2.81
New Mexico.				
Bayard, Fort	99	58	74.7	3.64
Gallinas Spring	91	59	.....	1.66
Selden, Fort	107	58	79.6	2.64
Union, Fort	92	45	63.9	1.82
Wingate, Fort	88	45	65.8	1.60
New York.				
Auburn	85	44	65.4	3.73
Brooklyn	90	55	.....	.....
Columbus, Fort	90	53	71.5	3.85
Cooperstown *	83	44	64.0	3.34
Factoryville*	87	39	65.5	2.63
Humphrey	92	48	66.2	3.37
Ithaca	90	42	65.8	3.04
Madison Barracks	93	43	70.7	1.49
Menands*	87	51	66.5	5.10
Niagara, Fort	99	52	69.6	0.69
Palermo	89	45	63.5	1.91
Palmyra *	91	51	71.3	.....
Penn Yan	.....	.....	.....	3.76
Plattsburg Bar'aks	88	45	65.4	2.20
Setauket	86	55	70.0	4.62
Starkey	88	50	70.4	4.84
Utica	93	28	62.0	.....
West Point	92	45	69.2	2.20
White Plains	83	57	69.3	2.87
North Carolina.				
Hot Springs	88	49	72.6	.....
Lenoir *	84	49	.....	7.50
Lincolnton	86	60	73.2	11.12
Raleigh *	91	60	78.0	8.85
Reidsville *	91	59	74.8	10.30
Statesville*	88	54	73.6	12.25
Weldon *	94	56	75.3	5.88
Ohio.				
Cleveland	94	46	68.2	3.51
College Hill*	106	54	76.6	3.75
Garrettsville	96	37	64.7	2.27
Hiram	96	52	68.3	2.83
Jacksonborough*	102	60	73.9	1.75
Napoleon	95	43	71 .	1.59
North Lewisburg	100	44	72.5	3.00
Portsmouth	96	47	72.2	1.75
Ruggles *	98	46	66.9	3.20
Ohio—Continued.				
Tiffin *a* *	98	45	68.6	1.86
Tiffin *b* *	98	48	71.1	1.66
West Milton*	104	47	70.0	5.00?
Wauseon	100	39	68.8	1.52
Yellow Springs	96	40	70.7	2.42
Oregon.				
Albany*	94	50	65.0	0.09
Bandon*	69	46	.....	0.05
East Portland*	90	40	.....	0.03
Eola *	89	50	62.9	.....
Klamath, Fort	90	26	61.4	0.51
La Grande	89	41	.....	0.49
Mount Angel	94	50	66.0	0.33
Pennsylvania.				
Altoona	95	44	70.9	1.33
Bethlehem*	92	52	71.5	3.47
Blooming Grove*	89	49	66.8	5.20
Catawissa	80	44	.....	4.12
Corry*	98	38	65.5	4.42
Dyberry	86	38	64.5	5.03
Easton	.....	.....	.....	4.30
Franklin*	90	40	65.9	5.18
Fallsington *	86	54	69.0	2.52
Germantown *	90	54	.....	2.26
Phillipsburg*	85	41	65.3	2.03
Quakertown*	86	44	66.0	4.75
State College	90	40	67.0	2.10
Wellsborough*	92	40	63.2	4.61
West Chester	86	51	69.9	2.49
Westown*	88	45	70.2	2.85
Wilkesbarre	91	42	67.4	4.15
South Carolina.				
Kirkwood	87	58	75.3	2.23
Spartanburg	94	49	74.2	7.84
Stateburg *	92	57	75.6	4.98
Tennessee.				
Ashwood	98	55	76.5	2.51
Austin *	103	64	81.7	1.85
Milan	102	55	78.0	0.28
Texas.				
Austin *	101	71	86.4	1.67
Cleburne *	97	66	74.3	16.30
Comfort	.....	.....	.....	4.81
Corsicana	.....	.....	.....	8.17
Concho, Fort	103	63	83.6	1.88
McIntosh, Fort	100	71	87.3	2.68
Midland*	102	60	80.7	1.21
New Ulm	100	70	83.4	1.72
Ringgold, Fort	107	69	80.9	1.61
Silver Falls	99	58	.....	2.37
Vermont.				
Brattleborough*	90	43	.....	7.63
Burlington*	86	47	.....	2.80
Lunenburg	84	42	64.9	2.36
Newport*	86	46	64.3	2.94
Strafford *	86	48	65.8	5.00
Virginia.				
Bird's Nest*	93	59	76.1	8.20
Bruington	90	57	.....	5.80
Dale Enterprise*	98	49	76.2	2.87
Marion*	92	48	69.5	3.90
Monroe, Fort	92	63	75.6	7.86
Summit*	97	46	72.5	.....
University of Va.	83	64	73.2	2.96
Variety Mills	94	44	71.0	4.91
Wytheville	88	43	68.8	5.78
Washington Territory.				
Blakely *	88	42	61.2	0.02
Kenewick*	104	68	.....	0.24
Tacoma *	82	48	60.5	trace.
Townsend, Fort	85	44	61.1	0.15
Spokane, Fort	100	42	69.5	0.44
Walla Walla, Fort.	99	44	69.8	0.32
West Virginia.				
Clarksburg*	94	40	73.6	1.73
Helvetia*	92	40	66.8	3.96
Middlebrook *	84	47	63.8	.....
Parkersburg	96	44	71.6	0.88
Wisconsin.				
Beloit	99	45	69.3	5.79
Delavan	101	43	68.6	3.63
Embarras *	89	48	66.4	4.75
Fond du Lac	100	39	66.3	4.98
Lancaster*	101	41	69.2	3.90
Madison	95	49	68.2	3.75
Manitowoc	88	44	65.7	2.76
Prairie du Chien	101	46	69.6	4.76
Wyoming.				
Camp Sheridan	91	37	58.3	.....
Laramie, Fort	97	49	68.3	1.34
McKinney, Fort	93	35	68.4	1.70
Washakie, Fort	95	37	66.2	0.70

Table of miscellaneous meteorological data for August, 1887—Signal Service observations.

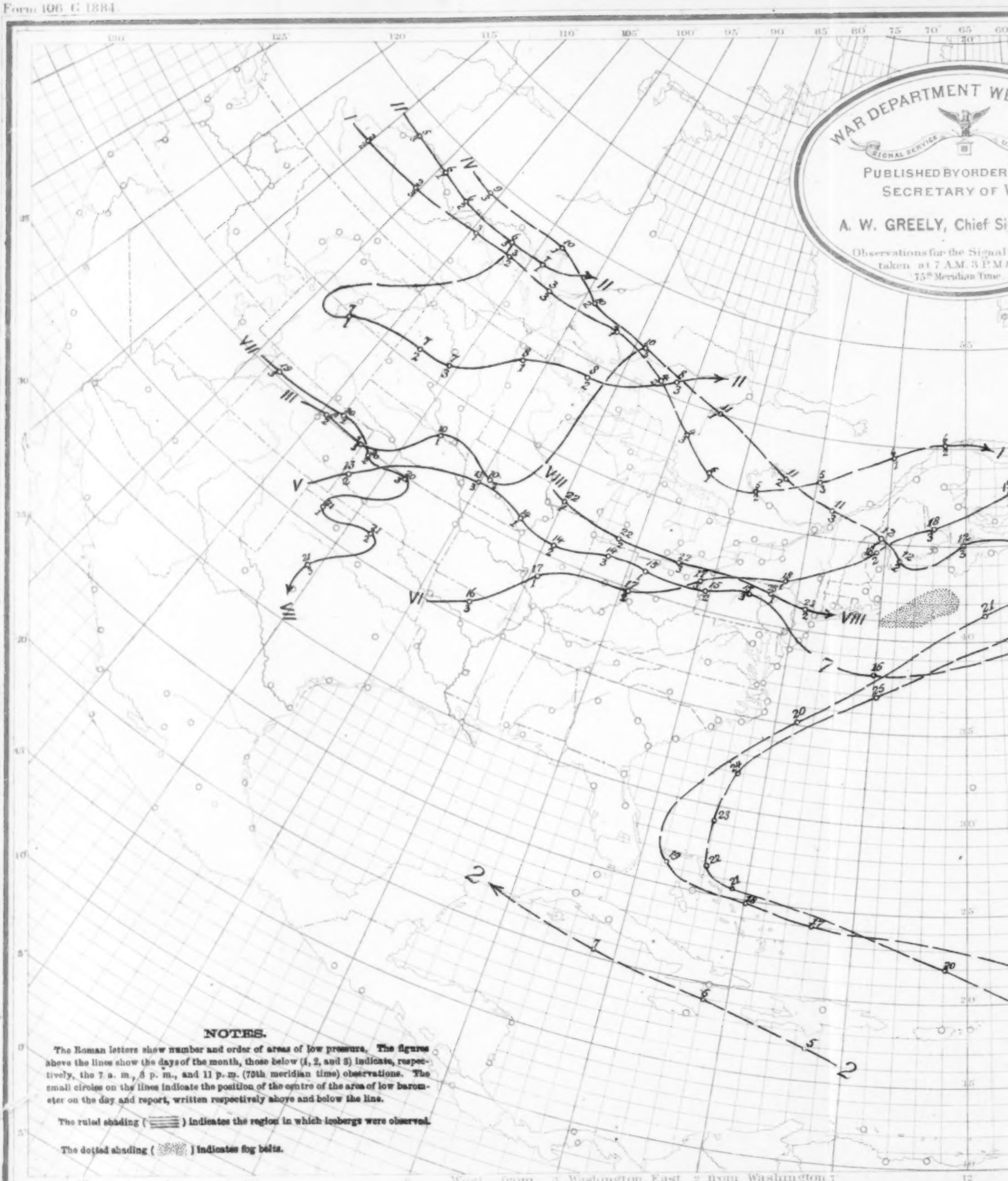
Stations and districts.	Elevation above sea-level, feet.	Atmospheric pressure (in inches and hundredths).								Temperature of the air (in degrees Fahrenheit).										Mean relative humidity, per cent.	Mean temperature of the dew-point (degrees Fahrenheit).	Precipitation (in inches).	Winds.							
		Mean actual barometer.	Departure from normal.	Mean reduced barometer.	Extremes.				Monthly range of barometer.	Monthly mean.	Departure from normal.	Extremes.				Daily ranges.							Departure from normal precipitation (in inches).	Total movement, miles.	Prevailing direction.	Maximum velocity.		Date.	No. of rainy days.	No. of cloudy days.	No. of fair days.	No. of clear days.
					Highest barometer	Date.	Lowest barometer	Date.				Max.	Date.	Mean max	Min.	Date.	Mean min.	Monthly range.	Greatest.	Date.	Least.	Date.					Miles p. h.	Direction.					
New England.										66.1	— 1.2												3.84	— 0.26							
Eastport	53	29.88	—.03	29.94	30.37	31	29.58	18	0.79	59.9	— 1.1	78.2	1	67.4	49.0	28	52.5	29.2	26.2	1	5.6	24	80.2	53.3	3.56	+ 0.29	5,440	s.	52	e.	24	11	4	13	14
Portland	99	29.85	—.02	29.95	30.33	31	29.58	18	0.75	64.8	— 2.2	85.8	12	72.3	47.5	30	56.9	38.3	25.9	14	4.2	24	74.6	55.7	6.56	+ 2.99	5,101	s.	45	s.	18	12	3	15	13
Manchester		29.72								65.3	— 3.7	87.9	1	75.8	45.7	14	55.3	44.2	33.0	9	4.1	24	80.1	58.3	6.33		3,345	nw.	21	nw.	26	12	5	16	10
Mount Washington	6,279	23.86	—.05	30.00	30.38	31	29.53	18	0.85	44.3	— 2.7	63.8	2	49.7	26.4	13	38.8	37.4	21.5	8	4.3	26	87.6	40.4	5.51	— 2.61	18,910	nw.	90	nw.	19	15	3	17	11
Northfield		29.04		29.96	30.35	31	29.62	18	0.73	61.0		83.1	2	71.6	36.8	29	49.2	46.3	37.1	14	4.1	23	83.1	55.1	4.53		5,063	s.	30	n.	26	12	4	10	17
Boston	134	29.85	—.03	29.97	30.33	31	29.63	18	0.70	67.1	— 0.9	80.3	12	75.0	52.2	31	60.5	34.1	22.4	10	6.0	24	74.2	57.9	3.05	— 1.48	6,436	sw.	40	s.	18	9	6	12	13
Edgartown										70.6		82.9	9	74.7	60.0	31	66.5	22.9							5.54			ne.		8			
Nantucket	14	29.96		29.96	30.26	31	29.72	25	0.54	67.4		82.9	1	71.5	53.2	30	61.6	29.7	15.8	30	2.4	7	80.3	60.6	4.35		6,641	sw.	36	n.	26	11	5	8	18
Wood's Holl	22	29.98		30.00	30.31	31	29.71	18	0.60	67.2		81.7	1	73.7	55.1	31	62.7	26.6	17.5	11	4.6	22	85.0	62.2	10.84		7,991	sw.	45	sw.	18	11	5	15	11
Vineyard Haven										70.5		88.5	1	76.8	56.1	29	64.3	32.4	18.9	17	6.7	31			8.90			w.		13			
Block Island	27	29.95	—.03	29.97	30.30	31	29.67	18	0.63	68.5	+ 0.5	82.5	2	74.0	49.3	13	63.2	33.2	20.8	13	4.1	3	84.2	63.3	3.13	— 0.13	7,853	sw.	36	n.	26	8	5	12	14
Narragansett Pier										73.0		85.0	12	75.8	48.0	28	60.2	37.0							3.33	— 0.46		sw.		11			
New Haven	107	29.87	—.04	29.97	30.30	31	29.73	23	0.57	67.8	— 1.2	86.5	12	76.4	49.7	31	60.5	36.8	23.0	8	6.1	22	78.1	60.2	4.80	— 0.92	4,592	n.	24	s.	18	9	7	16	8
New London	47	29.91	—.08	29.95	30.29	31	29.64	18	0.65	69.2	+ 0.2	83.5	12	75.8	52.3	31	61.9	31.2	20.7	9	5.9	22	78.0	61.7	4.19	— 1.14	3,634	n.	48	s.	18	13	8	18	5
Mid. Atlantic States.										72.5	— 1.0												5.58	+ 1.17							
Albany	85	29.91	—.02	29.99	30.34	31	29.66	18	0.68	68.5	— 2.5	90.0	2	78.0	48.3	29	59.6	41.7	27.3	9	8.4	22	71.2	57.7	4.61	+ 1.23	3,133	s.	24	w.	26	8	5	16	10
New York City	168	29.80	—.06	29.98	30.30	31	29.65	18	0.65	71.4	+ 0.4	88.1	1	78.9	54.9	27	65.2	33.2	19.1	12	5.4	15	69.2	60.1	3.66	+ 1.18	5,415	n.	33	w.	22	7	6	15	10
Philadelphia	117	29.88	—.03	29.99	30.30	31	29.73	24	0.57	73.0	0.0	90.1	5	82.0	56.3	29	65.9	33.8	22.0	21	6.8	2	68.9	61.3	2.31	— 2.57	5,700	n.	45	w.	11	8	9	14	8
Atlantic City	13	29.99	—.02	29.99	30.28	31	29.74	24	0.54	71.3	— 0.7	88.3	5	78.5	53.7	26	65.7	34.6	20.6	26	6.3	15	84.4	66.0	3.08	— 1.88	5,216	sw.	34	e.	20	18	2	16	13
Baltimore	43	29.95	—.04	29.98	30.27	31	29.73	24	0.55	73.3	— 0.7	91.0	12	82.0	55.2	29	66.2	35.8	21.8	30	6.9	2	70.7	62.5	4.15	— 0.31	3,652	n.	24	nw.	22	7	8	16	7
Washington City	100	29.89	—.04	29.99	30.29	9	29.72	24	0.57	73.2	— 0.8	91.7	6	82.0	51.0	29	64.6	40.7	25.3	30	5.7	2	72.8	63.0	2.34	— 2.32	3,156	n.	35	nw.	11	13	7	17	17
Cape Henry										75.3		94.0	6	80.7	61.2	27	69.9	32.8	24.5	20	2.2	17			16.82	+11.85		ne.		17			
Lynchburg	652	29.32	—.04	29.98	30.27	31	29.68	24	0.59	74.0	— 2.0	95.2	11	85.1	49.8	30	65.3	45.4	29.3	10	7.3	2	77.0	65.3	4.73	+ 0.74	1,927	s.	24	nw.	22	13	8	11	12
Norfolk	30	29.95	—.05	29.96	30.30	31	29.66	24	0.55	75.1	— 1.9	91.8	6	82.6	59.5	30	68.5	32.3	22.6	11	6.5	27	81.1	68.7	8.50	+ 2.63	4,786	n.	34	ne.	25	19	8	14	9
South Atlantic States.										78.3	— 0.4												7.71	+ 0.99							
Charlotte	808	29.16	—.03	29.98	30.23	31	29.67	24	0.56	74.7	— 1.3	95.1	6	85.8	52.8	31	66.3	42.3	27.3	12	7.2	27	80.1	67.5	9.02	+ 4.22	3,413	ne.	32	nw.	17	16	12	11	8
Hatteras	12	29.99	—.03	29.98	30.19	30	29.14	20	1.05	76.5	— 0.5	85.2	19	80.8	65.0	27	72.2	20.2	13.0	4	4.8	8	81.1	70.1	7.99	+ 1.48	9,868	n.	82	se.	20	12	6	10	15
Kitty Hawk	9									76.2		97.0	6	84.2	60.0	28	68.2	37.0	28.5	11	9.1	27			12.04	+ 4.56		ne.		11			
Raleigh	439	29.53		29.99	30.26	9	29.66	24	0.59	74.4		92.1	12	83.4	52.5	30	67.5	39.6	24.8	10	6.5	27	84.5	68.9	10.80		3,212	ne.	27	nw.	17	16	10	12	9
Southport	34									77.8		90.0	16	83.6	59.0	30	72.0	31.0	20.0	16	4.5	7			12.53			sw.		12			
Wash Woods										74.1		92.3	1	81.3	62.9	27	67.5	29.4	22.5	5	8.3	26			11.87	+ 5.33		ne.		16			
Wilmington	52	29.92	—.05	29.95	30.17	9	29.51	24	0.66	77.5	— 0.5	95.0	13	84.7	55.6	30	70.3	39.4	22.0	31	5.6	24	88.1	73.6	9.88	+ 2.19	5,115	sw.	28	ne.	19	14	4	16	11
Charleston	52	29.93	—.04	29.95	30.14	9	29.58	24	0.56	80.2	+ 0.2	97.9	16	86.7	66.7	31	74.2	31.2	20.1	15	7.1	1	78.1	72.2	4.12	— 3.72	7,177	sw.	30	e.	21	13	5	10	16
Columbia										76.6		95.8	17	86.3	56.0	31	68.9	39.8	25.8	17	7.2	7	81.9	70.2	5.21					12	9	11	11
Augusta	183	29.80	—.06	29.96	30.19	9	29.67	24	0.52	78.8	— 0.2	99.2	16	90.2	59.9	31	70.7	39.3	27.5	13	8.4	28	79.3	71.1	6.83	+ 2.25	2,478	ne.	18	ne.	31	12	10	12	9
Savannah	87	29.89	—.05	29.95	30.14	9	29.62	24	0.52	79.9	— 0.1	97.5	17	88.2	65.0	31	72.9	32.5	21.3	13	9.3	21	78.3	72.0	1.89	— 6.18	5,310	s.	35	sw.	31	10	5	11	15
Jacksonville	43	29.93	—.05	29.94	30.08	8	29.64	23	0.44	80.8	— 0.2	97.1	16	90.1	67.7	31	73.5	19.4	22.8	14	8.8	9	78.7	73.0	5.76	— 1.26	3,766	ne.	34	sw.	1	14	5	14	12
Florida Peninsula.										83.0	0.0												3.80	— 3.32							
Cedar Keys	32	29.93	—.07	29.91	30.06	3	29.61	23	0.45	82.5	+ 0.5	91.7	22	88.3	70.0	31	75.7	21.7	18.1	13	5.9	2	74.3	72.9	5.45	— 3.76	6,437	w.	35	sw.	1	9	3	14	14
Key West	22	29.93	—.06		30.03	4	29.65	22	0.38	83.4	— 0.6	89.3	20	87.3	75.1	6	79.7	14.2	12.7	6	1.4	14	75.9	74.8	2.14	— 2.89	6,324	e.	34	nw.	22	15	4	12	12
Titusville		29.95								80.8		94.4	27	88.1	69.4	15	73.6	25.0	20.3	27	6.4	31	81.2	74.1	2.47		7,381	se.	38	ne.	22	11	1	11	19
Eastern Gulf States.										79.6	0.0												4.52	— 1.03							
Atlanta	1,129	28.84	—.05	29.96	30.19	19	29.76	24	0.43	76.2	+ 0.2	91.2	15	84.8	54.6	31	68.2	36.6	25.4	25	5.1	1	72.6	65.9	7.51	+ 3.46	4,738	nw.	35	nw.	4	12	4	16	11
Pensacola	30	29.93	—.05	29.92	30.07	9	29.67	23	0.40	81.6	+ 1.6	93.0	14	88.5	68.7	31	74.9	24.3	19.9	14	7.7	2	75.5	72.7	3.42	— 7.00	4,636	sw.	24	sw.	31	11	3	14	14
Mobile	35	29.94	—.04	29.94	30.09	9	29.70	23	0.39	79.9	— 0.1	93.0	21	89.2	65.2	29	72.4	27.8	22.3	29	11.1	5	78.0	71.8	4.31	— 2.49	5,200	nw.	30	se.	9	8	5	17	9
Montgomery	217	29.74	—.05	29.94	30.12	9	29.71	23	0.41	79.3	— 0.7	90.5	15	90.4	59.1	31	71.4	37.4	25.5	26	11.0	27	78.1	71.1	2.01	— 1.50	3,172	ne.	24	sw.	26	7	3	14	14
Vicksburg	222	29.74	—.07	29.94	30.09	10	29.76	23	0.33	79.9	— 0.1	95.4	1	89.7	64.1	25	71.7	31.3	27.1	25	9.1	30	75.5	70.6	2.44	— 0.76	2,861	nw.	30	n.	5	8	3	15	13
Oxford										79.2		99.0	1	90.0	59.9	25	69.4	39.1	29.2	25	10.1	6	72.0	68.7	1.26					5	3	10	18
New Orleans	52	29.91	—.03	29.93	30.05	10	29.71	23	0.34	81.0	— 1.0	94.3	23	89.7	71.0	7	75.0	23.3	21.5	7	8.8	31	80.0	73.6	7.42	+ 2.09	4,134	se.	28	nw.	5	13	3	14	14
Western Gulf States.										80.9	+ 0.3												3.91	+ 0.84							
Shreveport	227	29.73	—.04	29.93	30.05	9	29.79	16	0.26	81.6	— 0.4	101.5	1	94.0	65.6	27	73.3	35.9	27.0	21	12.5	30	74.4	71.8	2.07	+ 0.03	2,534	se.	18	se.	24	8	4	14	13
Fort Smith	470	29.46	—.05	29.93	30.09	27	29.78	21	0.31	78.1	+ 0.1	100.8	14	89.2	57.1	24	69.0	43.7	27.8	14	7.9	25	74.9	68.4	4.94	+ 2.70	3,062	se.	30	n.	16	12	5	12	14
Little Rock	278	29.65	—.04	29.94	30.08	9	29.78	16	0.30	79.0	0.0	99.0	1	89.7	59.2	30	70.3	39.8	26.9	21	10.9	22	67.9	66.0	1.18	— 2.62	3,396	ne.	22	ne.	3	8	5	11	15
Corpus Christi		29.91		29.89	30.01	5	29.77	22	0.24	82.2		90.6	1	86.5	72.5	27	77.5	18.1	13.1	7	4.1	5	81.2	75.7	2.84		9,114	se.	34	e.	4	4	4	13	14
Galveston	40	29.93	—.03	29.93	30.04	4	29.80	23	0.24	83.0	0.0	91.3	26	88.8	71.4	30	77.5	19.9	17.7	28	7.8	10	73.8	73.7	6.43	+ 1.49	6,334	s.	24	nw.	22	12	2	12	17
Palestine	533	29.43	—.05	29.94	30.06	9	29.81	21	0.25	80.9	+ 0.9	100.0	6	93.0	61.8	27	72.1	38.2	20.0	16	5.6	30	71.4	69.4	5.18	+ 3.29	5,494	s.	30	e.	10	8	5	15	11
San Antonio	781	29.13	—.03	29.89	30.00	9	29.75	22	0.25	83.0	+ 1.0	99.6	1	93.8	67.3	23	73.9	32.3	26.3	1	9.7	26	71.1	71.5	3.63	+ 0.16	5,874	se.	30	ne.	19	8	9	20	2
Rio Grande Valley.										83.6	— 0.8												1.55	— 2.52							
Brownsville	57	29.87	— .03	29.88	29.98	6	29.76	23	0.22	81.8	— 0.2	92.7	26	90.6	71.4	15	76.0	21.3	21.1	15	9.5	5	83.4	75.8	1.45	— 3.00	4,831	se.	24	e.	4	7	0	9	22
Rio Grande City	230	29.71	—.04	29.90	30.01	9	29.76	23	0.25	85.4	— 1.4	101.0	1	97.4	71.0	13	75.7	30.0	25.6	13	14.6	27	65.8	71.0	1.65	— 2.66	6,201	s.	21	s.	3	4	1	11	19
Ohio Val. & Tenn.										75.6	+ 0.8												2.75	— 0.94							
Chattanooga	783	29.20	—.03	29.98	30.21	31	29.75	23	0.46	76.3	+ 0.3	96.0	15	87.4	57.8	31	67.8	38.2	28.9	15	10.2	26	73.0	65.9	3.13	— 1.07	3,152	ne.	34	n.	15	11	3	17	11
Knoxville	980	29.00	—.04	30.00	30.26	31	29.78	23	0.48	75.0	+ 1.0	94.1	5	85.6	53.9	31	66.4	40.2	25.4	21	6.8	1	72.9	64.7	4.48	+ 0.18	3,405	ne.	32	nw.	13	13	4	14	13
Memphis	320	29.64	—.05	29.95	30.12	31	29.80	1	0.32	78.9	— 0.1	97.5	2	89.4	58.6	25	70.6	38.9	26.4	25	10.8	26	70.4	67.6	1.21	— 3.06	3,889	nw.	28	w.	16	7	3	15	13
Nashville	549	29.40	—.04	29.95	30.21	31	29.75	1	0.46	78.5	+ 1.5	99.3	3	89.7	57.8	28	67.7	41.5	33.0	21	13.5	7	63.2	63.5	2.89	— 0.51	3,576	w.	36	ne.	1	7	3	13	15
Louisville	551	29.42	—.02	29.98	30.23	31	29.76	17	0.47	78.3	+ 2.3	99.1	5	88.5	55.1	25	67.8	44.0	29.2	8	11.5	17	55.8	59.6	2.74	— 0.83	4,702	n.	48	w.	5	4	4	14	13
Indianapolis	706	29.21	—.01	30.00	30.24	31	29.76	17	0.48	73.3	+ 0.3	99.0	4	83.9	49.2	25	62.2	49.8	33.1	9	7.8	15	58.6	55.5	3.15	— 0.35	3,409	ne.	30	w.	5	8	7	9	15
Terre Haute										73.6		99.8	4	84.8	50.2	28	62.5	48.6	33.6	3	10.9	23			3.90			e.		10			
Cincinnati	628	29.34	—.03	29.98	30.26	31	29.72	17	0.54	75.7	+ 0.7	99.6	4	85.7	53.6	29	65.7	46.0	27.6	8	9.9	23	59.6	59.6	2.81	— 1.20	4,481	ne.	36	n.	4	7	4	16	11
Columbus	812	29.15	—.03	29.99	30.27	31	29.70	17	0.57	72.5	— 0.5	97.4	4	82.1	41.9	29	59.5	45.5	33.3	8	9.8	24	59.5	55.9	2.21	— 1.50	4,301	ne.	31	nw.	12	10	5	14	12
Pittsburg	847	29.10	—.04	29.96	30.29	31	29.69	23	0.60	72.3	+ 0.3	93.3	10	81.6	45.8	28	62.2	47.5	28.4	30	10.5	15	65.9	59.0	2.16	— 1.13	3,524	nw.				11	3	21	7
Lower lake region.										68.4	— 0.8												2.45	— 0.74							
Buffalo	690	29.28	.00	30.00	30.32	31	29.74	18	0.58	68.1	+ 0.1	94.2	4	76.2	49.6	25	59.7	44.6	27.2	8	5.9	22	65.7	55.1	3.50	+ 0.17	5,300	sw.	30	s.	5	12	6	6	19
Oswego	335	29.62	—.03	29.96	30.31	31	29.63	18	0.68	66.3	— 1.7	87.3	4	73.5	47.9	29	58.8	39.4	24.9	9	6.2	19	72.1	56.5	1.69	— 0.76	5,922	se.	30	ne.	29	10	4	17	10
Rochester	631	29.34	—.01	29.99	30.32	31	29.70	18	0.62	66.4	— 1.6	89.4	3	75.4	43.7	27	57.3	45.7	28.4	3	8.4	22	67.1	45.1	1.59	— 1.65	6,160	sw.	25	s.	5	9	4	13	15
Erie	681	29.28	—.02	29.99	30.30	31	29.71	17	0.59	68.6	— 0.4	93.0	4	77.5	40.8	28	59.8	46.8	28.4	3	8.8	22	67.6	56.9	3.54	+ 0.27	5,021	s.	24	nw.	6	12	4	17	10
Cleveland	690	29.27	—.03	29.99	30.30	31	29.70	17	0.60	69.0	0.0	94.0	4	77.2	46.7	29	61.3	47.3	26.1	4	6.5	25	67.2	57.1	3.52	+ 0.24	4,763	se.	24	e.	8	9	5	13	13
Sandusky	638	29.35	.00	30.02	30.31	31	29.76	22	0.55	70.6	— 0.4	97.1	5	79.0	40.7	29	62.8	47.4	26.8	10	7.3	25	66.3	58.1	1.57	— 2.43	6,526	ne.	30	ne.	12	10	8	12	11
Toledo	651	29.33	.00	30.02	30.31	31	29.75	22	0.56	69.5	— 0.5	96.4	3	79.1	47.0	28	60.6	49.4	30.3	9	7.1	26	64.9	55.9	1.81	— 1.15	4,470	ne.	22	ne.	30	9	7	13	11
Detroit	602	29.32	.00	30.01	30.31	31	29.74	22	0.57	68.3	— 1.7	92.9	5	76.9	48.7	28	59.9	44.2	25.4	9	3.9	15	65.9	55.1	2.30	— 0.62	4,891	e.	19	n.	4	7	7	12	13
Upper lake region.										64.6	— 0.8												1.89	— 1.41							
Alpena	609	29.37	+.02	30.02	30.30	31	29.75	18	0.55	61.6	— 1.4	92.8	4	70.3	40.3	25	52.3	52.5	27.2	30	7.7	23	73.8	52.5	1.09	— 2.63	5,423	w.	29	se.	8	7	6	17	8
Escanaba	608	29.36	+.03	30.02	30.24	29	29.75	17	0.49	62.1	— 0.9	82.2	11	69.9	38.0	26	53.0	44.2	28.4	19	6.8	15	74.3	53.3	1.44	— 2.76	5,511	n.	26	ne.	4	10	8	13	10
Grand Haven	620	29.35	+.01	30.00	30.27	30	29.76	22	0.51	65.5	— 1.5	90.9	10	74.5	46.1	29	58.3	44.8	26.0	31	7.9	11	74.4	56.3	2.26	— 0.96	5,334	nw.	36	nw.	10	6	9	13	9
Lansing	870	29.10	—.01	30.00	30.28	30	29.75	22	0.53	68.5	— 0.5	94.2	3	78.3	45.0	29	58.8	49.2	30.5	30	5.9	15	76.0	60.0	0.89		3,429	sw.	20	w.	18	9	4	10	11
Mackinaw City	605	29.38	+.05	30.04	30.26	29	29.72	18	0.54	62.9	+ 0.9	88.0	8	70.6	45.6	27	55.4	42.4	24.8	31	5.1	22	69.5	52.1	0.28	— 2.54	5,863	nw.	37	w.	9	8	4	14	13
Marquette	672	29.30	+.03	30.03	30.24	29	29.73	17	0.51	60.7	— 1.3	88.6	8	69.0	40.9	26	52.5	47.7	33.0	7	7.0	16	76.1	52.7	2.90	— 0.24	5,617	nw.	30	nw.	4	13	9	13	9
Port Huron	639	29.33	.00	30.01	30.32	31	29.73	22	0.59	66.6	+ 0.6	92.2	3	75.0	44.4	26	56.1	47.8	33.5	9	6.8	23	73.0	56.9	1.87	— 0.94	5,853	ne.	28	ne.	6	8	9	11	11
Chicago	717	29.24	—.02	29.98	30.20	30	29.71	22	0.49	69.7	— 1.3	97.7	10	70.5	49.1	24	60.8	48.6	29.5	10	6.9	17	67.9	57.4	3.35	+ 0.11	6,579	e.	30	w.	10	9	7	11	13
Green Bay	616	29.35		30.02	30.24	29	29.78	17	0.46	65.8		92.7	1	74.9	42.1	26	56.7	50.6	31.1	1	5.6	13	70.7	55.0	2.93		4,425	ne.	33	ne.	22	8	10	18	13
Milwaukee	697	29.27	+.01	30.01	30.22	30	29.78	22	0.44	66.5	— 0.5	92.8	9	74.2	46.9	24	60.0	45.9	27.5	9	3.6	14	75.1	57.9	2.25	— 0.86	6,338	se.	48	nw.	9	11	10	12	9
Duluth	672	29.27	+.01	30.00	30.22	26	29.72	8	0.50	62.4	— 1.6	94.2	8	72.4	46.1	24	54.5	48.1	31.9	4	8.6	16	76.6	54.3	1.53	— 1.88	4,826	ne.	31	ne.	22	13	5	18	8

Table of miscellaneous meteorological data for July, 1887—Signal Service observations—Continued.

Stations and districts.	Elevation above sea-level, feet.	Atmospheric pressure (in inches and hundredths).									Temperature of the air (in degrees Fahrenheit).													Mean relative humidity, per cent.	Mean temperature of the dew-point (degrees Farenheit).	Precipitation (in inches).	Departure from normal precipitation (in inches).	Winds.							
		Mean actual barometer.	Departure from normal.	Mean reduced barometer.	Extremes.					Monthly range of barometer.	Monthly mean.	Departure from normal.	Extremes.						Mean range.	Daily ranges.										Total movement, miles.	Prevailing direction.	Maximum velocity.			No. of rainy days.	No. of cloudy days.	No. of fair days.	No. of clear days.
					Highest barometer	Date.	Lowest barometer	Date.	Date.				Max.	Date.	Mean max	Min.	Date.	Mean min.		Greatest.	Date.	Least.	Date.								Miles p. h.	Direction.	Date.				
Extreme northwest.											62.8	— 2.0														2.16	— 0.33							
Moorhead	926	28.96	—.01	29.96	30.21	26	29.54	8	0.67		62.7	— 2.3	84.0	3	73.5	37.2	25	52.2	46.8	35.0	6	7.8	30	77.6	54.8	1.45	— 1.97	6,515	se.	42	s.	28	5	10	17	4
Saint Vincent	804	29.12	+.03	30.00	30.26	22	29.50	8	0.76		60.7	— 2.3	88.0	7	73.8	29.3	25	47.9	58.7	40.0	18	7.4	14	83.2	55.2	1.68	— 1.00	3,627	s.	30	s.	29	8	8	15	8
Bismarck	1,694	28.18	+.01	29.97	30.30	22	29.42	7	0.88		64.6	— 2.4	90.9	6	76.0	37.3	24	54.3	53.6	40.3	6	9.0	22	73.9	55.2	1.62	— 0.98	5,471	e.	36	w.	6	17	9	14	8
Fort Buford	1,854	27.94	.00	29.88	30.28	22	29.49	28	0.79		64.4	— 1.6	92.4	6	75.7	44.4	24	55.1	48.0	37.4	6	8.0	31	70.8	53.1	3.91	+ 2.76	6,166	e.	48	ne.	7	12	13	15	3
Fort Totten	1,487	28.38	.....	29.99	30.27	22	29.55	7	0.72		61.7	— 1.3	84.2	7	71.2	37.0	24	51.8	47.2	27.6	16	6.7	30	75.9	53.3	2.36	+ 0.13	8,024	se.	54	w.	8	9	6	17	3
Fort Yates	.....	.....	.....	.....	.....	.....	.....	.....	.....		67.9	.....	96.6	6	80.4	35.4	24	55.4	61.2	41.6	6	12.0	26	.....	.....	1.94	— 0.93	.....	se.	.....	.....	...	14	.....	...	...
Upper Miss. Valley.											72.8	— 0.2														2.39	— 0.96							
Saint Paul	331	29.10	+.01	29.98	30.20	27	29.78	10	0.42		66.0	— 3.0	93.5	8	76.8	41.1	25	56.3	52.4	28.6	1	9.8	14	76.3	57.4	3.37	— 0.30	3,073	nw.	29	w.	2	14	13	15	3
La Crosse	744	29.24	+.04	30.02	30.22	27	29.77	10	0.45		67.7	— 2.3	96.0	2	77.8	42.3	24	58.3	53.7	33.4	1	4.9	26	70.0	55.7	2.21	— 1.46	4,779	e.	28	nw.	9	11	11	16	4
Davenport	515	29.34	—.01	29.98	30.16	28	29.73	10	0.43		72.2	+ 0.2	98.3	3	82.8	46.2	24	61.9	52.1	30.6	2	6.8	21	61.8	56.3	3.23	— 0.88	4,799	e.	45	n.	10	14	5	19	7
Des Moines	866	29.08	—.01	29.98	30.18	27	29.74	10	0.43		72.4	+ 0.4	100.9	10	83.9	45.6	24	61.4	55.3	34.5	1	8.6	16	63.9	57.6	2.66	— 0.92	3,548	s.	28	s.	10	9	7	13	11
Dubuque	565	29.30	.00	30.00	30.19	28	29.76	10	0.43		71.0	0.0	99.1	10	81.6	43.8	24	60.3	55.3	36.1	9	7.3	23	68.9	58.8	4.40	+ 0.78	2,807	se.	24	sw.	10	14	7	16	8
Keokuk	618	29.33	—.02	29.97	30.14	27	29.78	10	0.36		74.1	+ 0.1	100.0	10	85.8	47.6	24	63.8	52.4	31.1	7	11.4	23	58.0	56.4	2.38	— 0.88	5,090	n.	24	nw.	22	7	5	13	13
Cairo	359	29.61	—.04	29.97	30.16	31	29.83	17	0.33		78.0	0.0	97.2	1	88.2	57.8	25	68.2	39.4	25.8	15	10.6	23	63.8	63.3	1.10	— 1.66	4,552	n.	37	nw.	15	8	5	14	12
Springfield	644	29.33	—.02	30.00	30.18	28	29.80	22	0.38		74.3	+ 0.3	97.0	10	85.5	49.4	24	63.2	47.6	31.7	8	6.4	21	61.4	58.5	1.05	— 1.99	5,143	n.	24	sw.	22	4	5	16	10
Saint Louis	571	29.39	—.02	29.97	30.14	28	29.78	17	0.36		79.2	+ 2.2	99.0	11	87.5	52.1	24	70.6	46.9	22.9	11	9.0	5	52.2	58.9	1.14	— 1.36	4,896	n.	30	sw.	3	8	6	11	14
Missouri Valley.											69.9	— 1.8														4.51	+ 1.26							
Lamar	1,028	28.95	.....	30.00	30.13	27	29.85	21	0.28		74.9	— 1.1	98.4	14	87.1	48.0	24	64.3	50.4	33.0	15	9.1	25	73.4	64.6	3.85	— 1.85	5,591	s.	36	sw.	5	8	7	16	8
Leavenworth	842	29.11	—.02	29.98	30.20	27	29.79	10	0.41		73.3	— 1.7	99.7	10	84.6	48.0	24	63.9	51.7	35.5	2	7.6	25	73.2	63.1	7.11	+ 3.85	3,755	se.	33	n.	20	12	6	18	7
Topeka	.....	.....	.....	.....	.....	.....	.....	.....	.....		73.0	.....	104.2	13	85.9	46.4	24	63.1	57.8	39.7	2	6.6	25	80.2	65.8	5.39	.....	.....	.....	.....	.....	12	7	17	7
Omaha	1,113	29.84	—.02	30.00	30.21	27	29.77	10	0.44		72.0	— 2.0	101.5	10	82.3	48.2	24	63.0	53.3	30.7	3	10.4	16	67.8	59.2	3.94	+ 0.41	5,477	s.	34	n.	4	11	9	11	11
Crete	.....	.....	.....	.....	.....	.....	.....	.....	.....		71.6	.....	101.8	10	83.7	46.2	24	60.5	55.6	37.9	1	5.7	25	71.1	60.3	3.76	.....	.....	.....	.....	.....	12	8	14	9
Valentine	2,614	27.28	.....	29.93	30.29	5	29.58	7	0.71		67.3	— 2.7	96.2	7	78.8	38.0	11	48.5	58.2	58.2	7	7.3	25	69.4	55.3	2.94	+ 1.08	7,608	s.	48	n.	16	13	8	15	8
Fort Sully	1,600	28.25	.....	29.92	30.25	23	29.44	7	0.81		67.7	+ 0.7	98.0	7	79.7	43.0	24	58.0	55.0	36.6	6	5.9	25	71.7	56.6	3.12	+ 1.16	7,428	e.	48	e.	20	13	7	14	10
Huron	1,307	28.58	—.01	29.96	30.24	23	29.58	7	0.66		65.5	— 3.5	91.4	7	76.5	40.3	23	56.2	51.1	33.6	11	9.4	31	72.4	55.4	6.13	+ 2.76	6,600	se.	39	se.	31	17	8	15	8
Yankton	1,234	28.64	—.06	29.94	30.20	23	29.66	7	0.54		68.9	— 3.1	98.7	9	80.7	43.7	24	59.9	55.0	35.7	9	4.5	25	76.6	60.5	4.46	+ 1.41	4,468	s.	45	s.	8	13	6	14	11
Northern slope.											64.0	— 2.4														2.99	+ 1.60							
Fort Assiniboine	2,690	27.16	—.01	29.96	30.32	22	29.59	28	0.73		62.7	— 3.3	89.0	18	76.0	42.4	9	49.8	46.6	40.1	17	6.2	8	61.2	47.1	2.56	— 0.88	6,750	ne.	36	ne.	30	9	10	10	11
Fort Custer	3,040	26.82	—.02	29.90	30.25	5	29.50	28	0.75		67.9	— 2.1	93.6	6	81.6	41.0	5	53.5	52.6	44.2	5	6.7	24	50.7	45.2	1.48	+ 0.32	5,375	n.	60	nw.	19	12	3	14	14
Fort Maginnis	4,320	25.60	—.04	29.94	30.25	4	29.55	28	0.80		60.4	— 3.6	88.7	18	73.6	39.7	25	49.6	49.0	38.4	5	8.0	8	69.7	49.3	4.54	+ 3.73	5,937	nw.	40	ne.	31	13	10	12	9
Helena	4,069	25.85	—.03	29.92	30.23	4	29.62	28	0.61		63.0	— 5.0	87.1	18	74.5	40.2	31	49.8	46.9	39.4	6	8.4	23	49.7	41.3	1.86	+ 1.14	4,301	sw.	35	sw.	6	12	5	19	7
Poplar River	2,002	27.84	—.02	29.92	30.30	22	29.53	28	0.83		64.3	— 0.7	94.0	1	77.6	38.8	24	51.5	55.2	50.8	6	13.5	22	74.7	55.0	3.72	+ 3.04	5,189	e.	36	n.	12	11	6	17	8
Deadwood	4,600	25.42	—.03	29.99	30.38	5	29.51	7	0.87		67.4	— 2.6	88.0	7	70.9	41.0	5	52.5	47.0	36.2	7	5.5	24	80.4	54.8	3.22	+ 1.16	3,343	sw.	24	s.	27	17	9	16	6
Cheyenne	6,105	24.07	—.06	29.92	30.24	5	29.68	28	0.56		62.9	— 1.1	91.8	7	77.6	44.8	30	50.6	47.0	39.2	6	9.0	24	59.8	44.8	1.90	+ 0.38	6,602	s.	42	n.	4	15	3	23	5
Fort Laramie[b]	.....	.....	.....	.....	.....	.....	.....	.....	.....		68.7	.....	95.0	19	82.0	49.8	5	55.4	45.2	39.9	6	22.8	9	.....	.....	2.11	.....	.....	se.	.....	.....	...	10	.....	...	...
North Platte	2,841	27.06	—.05	29.93	30.23	5	29.62	7	0.61		69.8	— 1.2	99.8	9	82.4	46.8	25	59.2	53.0	35.5	9	7.0	24	73.4	59.5	4.61	+ 2.13	6,864	se.	54	e.	4	10	4	15	12
Middle slope.											73.4	+ 0.4														2.75	+ 0.33							
Colorado Springs	.....	.....	.....	.....	.....	.....	.....	.....	.....		66.2	.....	90.1	7	79.2	45.5	25	53.5	44.6	39.6	7	8.9	23	59.7	49.3	4.42	.....	.....	.....	.....	.....	13	6	13	12
Denver	5,294	24.78	—.06	29.87	30.21	5	29.56	7	0.65		68.9	— 1.1	94.6	7	83.0	46.9	30	54.5	47.7	43.1	6	15.9	23	54.6	46.8	2.68	+ 1.14	5,013	s.	48	n.	28	9	4	16	11
Pike's Peak	14,134	18.03	.....	29.90	30.10	6	29.68	7	0.42		38.0	.....	55.7	9	47.0	22.1	29	32.2	33.6	21.6	18	6.5	24	70.0	27.8	3.84	+ 0.12	10,951	sw.	60	sw.	29	21	4	21	6
Las Animas	3,899	26.02	—.07	29.83	30.15	5	29.56	7	0.59		74.1	+ 1.1	99.8	7	88.6	51.9	23	60.7	47.9	37.6	4	11.3	23	52.9	51.8	2.35	+ 0.42	4,977	e.	36	n.	4	8	5	15	11
Concordia	1,384	28.52	.....	29.95	30.16	5	29.69	20	0.47		73.0	— 1.0	100.9	10	83.5	52.1	25	64.2	48.8	32.6	2	5.4	29	69.0	60.9	3.88	+ 1.94	5,547	se.	40	ne.	5	9	8	14	9
Dodge City	2,523	27.39	—.04	29.95	30.19	5	29.70	29	0.49		74.8	+ 0.8	101.8	10	87.2	51.0	25	63.9	50.8	37.8	3	7.0	24	64.6	59.6	2.28	— 0.95	7,531	s.	34	ne.	5	9	4	17	10
Fort Reno	.....	.....	.....	.....	.....	.....	.....	.....	.....		80.0	.....	104.4	3	92.7	51.8	24	67.3	52.6	.....	.....	.....	.....	.....	.....	1.87	— 0.92	.....	.....	.....	.....	...	...	...	...
Fort Supply	.....	.....	.....	.....	.....	.....	.....	.....	.....		78.9	.....	101.4	4	88.7	53.0	29	69.1	48.4	34.0	29	10.3	26	.....	.....	3.65	+ 1.81	.....	s.	.....	.....	...	12	.....	...	...
Fort Elliott	2,700	27.24	—.03	29.86	30.09	27	29.69	29	0.40		76.0	+ 2.0	98.5	4	88.7	59.4	24	65.3	48.1	34.2	20	12.8	16	68.1	63.4	2.52	— 1.11	8,017	se.	36	e.	19	7	5	14	12
Southern slope.											78.7	+ 1.7														3.40	— 0.29							
Fort Sill	1,200	28.72	—.04	29.92	.....	.....	.....	.....	.....		80.4	+ 0.4	103.5	4	93.3	55.5	24	69.9	48.0	31.5	19	6.8	26	64.1	64.7	5.89	+ 3.08	7,454	se.	32	e.	30	15	3	11	17
Abilene	1,748	28.15	.....	29.89	30.09	27	29.72	21	0.37		81.2	+ 2.2	99.1	21	91.2	63.0	26	72.3	35.1	24.5	18	11.6	26	61.2	65.5	1.10	— 0.93	7,147	s.	30	se.	31	5	3	15	13
Fort Davis	4,928	25.20	—.05	29.88	30.02	27	29.76	24	0.26		74.6	+ 2.6	91.0	3	85.8	56.3	27	65.7	34.7	27.0	15	11.1	23	51.3	54.0	3.11	— 1.80	3,786	ne.	24	ne.	21	12	2	16	13
Fort Stanton	6,150	24.04	.....	29.84	30.05	6	29.66	24	0.39		63.5	.....	89.6	3	79.3	43.9	30	53.7	45.7	39.1	30	12.7	24	70.9	52.8	3.49	— 1.51	2,904	w.	27	w.	11	12	2	19	10
Southern plateau.											75.6	+ 1.1														2.53	+ 0.12							
El Paso	3,764	26.21	—.05	29.83	29.99	10	29.72	16	0.27		79.9	+ 1.9	102.0	4	92.8	61.0	27	68.6	41.0	32.0	2	12.8	23	59.4	63.0	1.68	— 0.55	2,484	se.	25	s.	4	11	2	20	9
Lava	.....	.....	.....	.....	.....	.....	.....	.....	.....		78.5	.....	103.2	4	94.8	56.5	24	62.2	46.7	.....	.....	.....	.....	.....	.....	1.94	— 0.61	.....	sw.	.....	.....	...	13	.....	...	...
Santa Fé	7,026	23.35	—.04	29.92	30.10	6	29.78	30	0.32		65.8	+ 0.8	86.5	4	77.8	45.5	25	56.4	41.0	29.0	29	7.7	27	49.2	42.3	1.57	— 1.37	3,454	sw.	24	nw.	1	11	1	18	12
Fort Apache	5,020	25.00	—.03	29.90	30.04	5	29.79	16	0.25		71.2	+ 1.2	98.0	5	87.3	50.1	29	57.8	47.9	45.5	5	11.6	30	64.9	56.8	3.92	— 0.82	4,375	e.	33	se.	19	17	5	18	8
Fort Bowie	.....	.....	.....	.....	.....	.....	.....	.....	.....		76.4	.....	97.2	3	88.4	60.0	24	67.3	37.2	.....	.....	.....	.....	.....	.....	5.51	+ 3.14	.....	sw.	.....	.....	...	15	.....	...	...
Fort Grant	4,914	25.20	—.05	29.86	30.02	9	29.74	16	0.28		74.7	+ 0.7	96.6	3	86.4	57.7	29	65.4	38.9	29.3	3	8.5	23	43.5	48.7	6.20	+ 2.90	3,490	n.	40	w.	9	10	3	21	7
Fort McDowell	.....	.....	.....	.....	.....	.....	.....	.....	.....		88.8	.....	115.0	17	106.1	64.0	31	71.4	51.0	.....	.....	.....	.....	.....	.....	1.54	+ 0.62	.....	w.	.....	.....	...	9	.....	...	...
Fort Thomas	.....	.....	.....	.....	.....	.....	.....	.....	.....		83.6	.....	105.7	3	96.7	62.1	25	70.5	43.6	43.4	3	15.2	30	.....	.....	2.53	— 0.11	.....	sw.	.....	.....	...	12	.....	...	...
Fort Verde	.....	.....	.....	.....	.....	.....	.....	.....	.....		79.8	.....	102.0	7	95.2	57.0	4	64.4	45.0	.....	.....	.....	.....	.....	.....	2.96	— 0.28	.....	sw.	.....	.....	...	10	.....	...	...
Prescott	5,389	24.75	—.04	29.88	30.01	5	29.74	30	0.27		71.1	+ 1.1	93.0	6	84.9	49.8	31	57.9	43.2	41.3	3	13.2	10	65.0	57.4	0.71	— 2.49	4,912	sw.	31	sw.	30	7	5	5	21
San Carlos	.....	.....	.....	.....	.....	.....	.....	.....	.....		84.0	.....	108.4	6	97.3	54.5	30	70.8	53.9	43.0	3	11.0	28	.....	.....	1.56	— 1.61	.....	e.	.....	.....	...	1	.....	...	...
Willcox	.....	.....	.....	.....	.....	.....	.....	.....	.....		77.8	.....	101.0	4	92.6	58.0	24	63.0	48.0	.....	.....	.....	.....	.....	.....	5.31	+ 3.38	.....	.....	.....	.....	...	6	.....	...	...
Yuma	141	29.59	—.06	29.70	29.84	10	29.56	17	0.28		90.9	+ 0.9	112.5	6	104.9	59.5	31	74.3	53.0	46.6	3	16.9	19	49.2	66.7	trace	— 0.49	5,219	s.	26	s.	22	0	1	3	27
Keeler	3,622	26.20	.....	29.71	29.87	5	29.50	29	0.37		79.7	.....	98.8	6	91.8	53.4	31	64.9	45.4	34.3	18	15.8	30	22.2	35.6	0.00	— 0.10	4,609	se.	30	se.	30	0	0	1	30
Middle plateau.											71.3	— 0.7														0.98	— 0.27							
Fort Bidwell	4,615	25.37	.....	29.92	30.14	3	29.73	23	0.41		65.7	.....	91.7	5	81.0	32.5	31	48.9	59.2	36.9	5	20.5	31	47.2	42.9	0.21	+ 0.15	4,301	w.	42	w.	6	2	1	8	22
Winnemucca	4,358	25.55	—.04	29.80	30.06	31	29.52	29	0.54		68.6	— 1.4	93.3	5	85.6	26.0	31	48.3	67.3	46.4	20	21.2	30	24.4	26.8	0.13	+ 0.05	5,601	w.	44	w.	29	1	0	6	25
Frisco	6,406	23.73	.....	29.74	29.96	10	29.54	30	0.42		69.9	.....	86.3	6	79.4	37.0	31	60.2	49.3	30.1	31	13.5	11	29.0	33.1	0.54	— 3.20	9,090	sw.	44	sw.	30	4	2	10	19
Salt Lake City	4,348	25.57	—.07	29.79	30.00	5	29.53	30	0.47		74.0	0.0	94.9	6	80.1	45.6	31	60.6	49.3	36.9	16	14.0	24	40.0	46.6	0.69	— 0.14	4,524	se.	36	s.	30	8	2	15	14
Montrose	5,780	24.33	.....	29.85	30.06	18	29.65	27	0.41		67.2	.....	90.5	8	82.1	41.8	25	52.8	48.7	38.2	6	12.4	28	49.6	44.3	2.12	+ 0.32	4,657	s.	36	nw.	24	12	3	9	17
Fort Bridger	6,643	23.54	.....	29.90	30.18	5	29.66	7	0.52		61.2	.....	86.2	21	71.9	37.5	31	44.6	48.7	46.8	21	5.9	24	50.7	41.7	2.21	+ 1.18	5,344	w.	48	w.	9	9	4	19	8
Northern plateau.											70.3	+ 1.6														0.55	+ 0.40							
Boisé City	2,750	27.08	—.04	29.85	30.08	4	29.54	6	0.55		70.5	— 1.5	97.3	16	87.1	39.2	31	51.0	58.1	44.6	16	15.2	3	40.4	42.3	0.29	+ 0.21	1,358	nw.	28	e.	23	3	2	10	19
Ashland	.....	.....	.....	.....	.....	.....	.....	.....	.....		66.5	.....	94.0	5	82.9	40.0	31	50.2	54.0	44.0	12	16.0	30	.....	.....	0.04	+ 0.04	.....	w.	.....	.....	...	3	.....	...	...
Fort Klamath	.....	.....	.....	.....	.....	.....	.....	.....	.....		57.9	.....	87.0	5	79.6	27.0	8	36.1	60.0	51.0	20	22.0	31	.....	.....	0.57	+ 0.56	.....	w.	.....	.....	...	6	.....	...	...
Lakeview[c]	.....	.....	.....	.....	.....	.....	.....	.....	.....		65.8	.....	89.5	6	82.9	41.0	12	48.8	48.5	40.5	3	24.0	11	.....	.....	0.54	0.00	.....	n.	.....	.....	...	5	.....	...	...
Linkville	.....	.....	.....	.....	.....	.....	.....	.....	.....		63.8	.....	90.0	5	78.2	31.7	30	49.3	58.3	45.4	12	12.8	29	.....	.....	0.42	+ 0.42	.....	n.	.....	.....	...	6	.....	...	...
Spokane Falls	1,909	27.91	—.04	29.89	30.18	4	29.64	27	0.54		68.1	+ 0.1	97.3	17	81.9	43.3	11	52.3	54.0	44.5	11	12.1	30	59.1	51.5	1.26	+ 0.96	1,811	sw.	10	sw.	12	5	6	11	14
Walla Walla	1,018	28.84	.....	29.91	30.23	4	29.62	11	0.61		72.2	+ 6.2	98.0	15	85.6	44.3	31	58.9	53.7	38.0	5	8.2	30	41.8	45.4	0.71	+ 0.59	4,182	sw.	25	sw.	6	4	3	9	19
N. Pac. coast region.											59.5	— 1.2														0.43	— 0.67							
Fort Canby	179	29.83	.00	30.02	30.29	3	29.87	25	0.32		56.8	— 2.2	73.2	9	61.9	48.4	4	53.6	24.8	19.6	9	3.3	24	89.3	53.5	0.16	— 0.65	4,586	nw.	30	s.	11	1	18	8	5
Olympia	36	29.97	—.02	30.01	30.30	3	29.84	23	0.46		61.1	— 0.9	84.8	5	72.2	40.1	30	49.0	44.7	37.8	5	11.0	7	77.7	53.5	0.18	— 0.54	2,084	n.	14	sw.	6	2	3	16	12
Port Angeles	14	29.99	.....	30.01	30.29	3	29.78	11	0.51		55.1	— 2.9	81.5	11	63.2	38.7	29	47.3	42.8	29.8	11	6.8	13	87.7	51.2	0.14	— 0.80	4,011	s.	24	w.	11	2	1	15	15
Pysht	.....	.....	.....	.....	.....	.....	.....	.....	.....		55.6	.....	71.5	10	64.9	39.5	30	46.3	32.0	.....	.....	.....	.....	.....	.....	0.07	.....	.....	sw.	.....	.....	...	3	.....	...	...
Tatoosh Island	86	29.92	.00	30.02	30.31	3	29.83	11	0.48		54.7	— 1.3	65.7	11	60.4	43.6	9	50.2	22.1	18.7	9	5.0	6	94.2	52.9	1.39	— 3.05	5,958	sw.	36	e.	10	4	8	16	7
Astoria	.....	30.01	.....	.....	.....	.....	.....	.....	.....		59.3	.....	77.0	9	65.5	47.5	4	54.8	29.5	27.5	4	3.6	24	80.3	53.0	0.49	— 0.31	4,287	sw.	20	sw.	21	7	19	8	4
Portland	80	29.91	—.02	30.00	30.25	3	29.81	23	0.44		64.5	+ 0.5	90.5	10	75.8	45.0	30	54.9	45.5	35.1	10	9.8	31	69.4	53.2	0.58	— 0.09	3,403	nw.	22	e.	11	3	4	10	17
Roseburg	523	29.43

Chart I. Tracks of Areas of Low P

Form 196 C 1884.



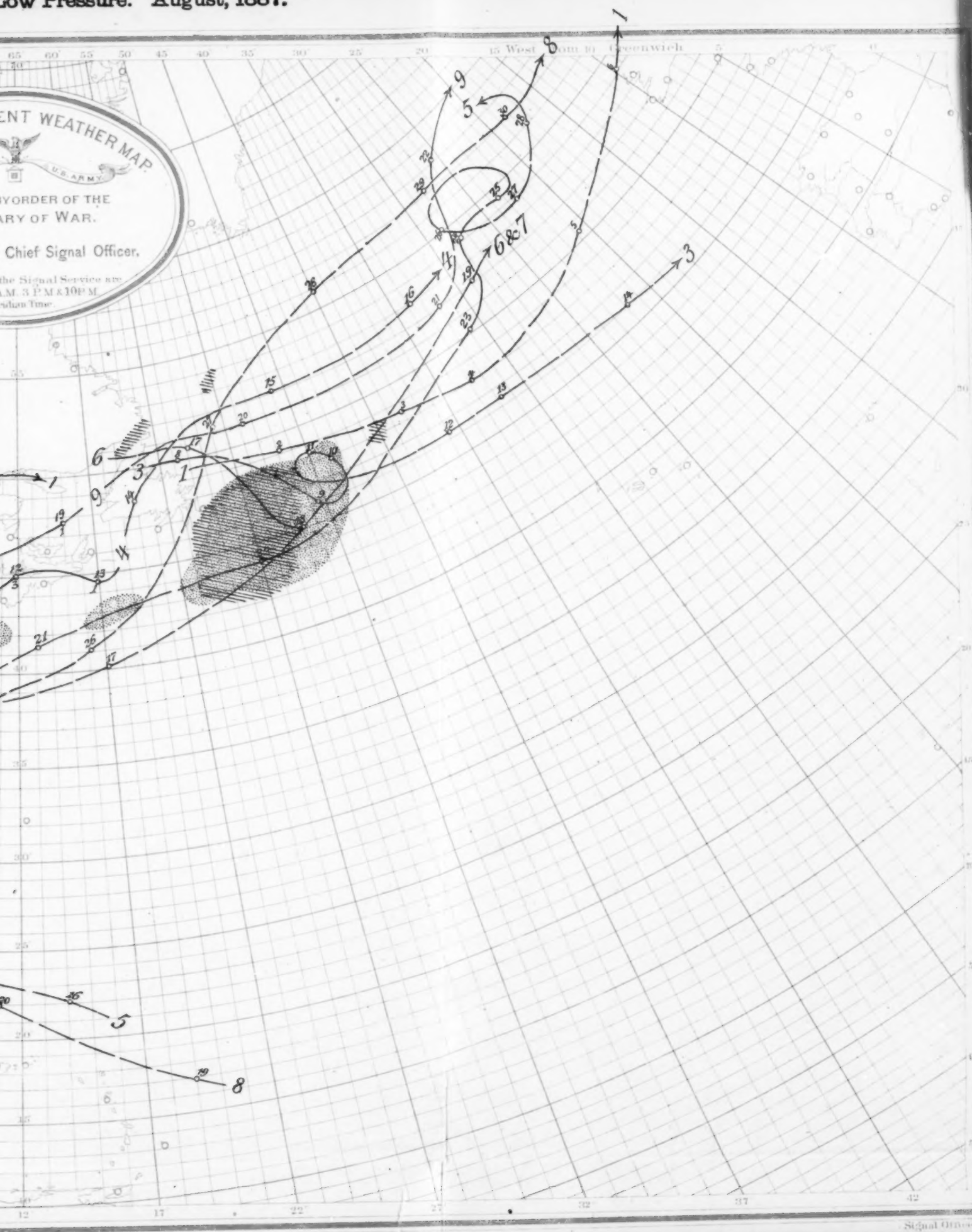
NOTES.

The Roman letters show number and order of areas of low pressure. The figures above the lines show the days of the month, those below (1, 2, and 3) indicate, respectively, the 7 a. m., 3 p. m., and 11 p. m. (75th meridian time) observations. The small circles on the lines indicate the position of the centre of the area of low barometer on the day and report, written respectively above and below the line.

The ruled shading ( ) indicates the region in which icebergs were observed.

The dotted shading ( ) indicates fog belts.

Low Pressure. August, 1887.

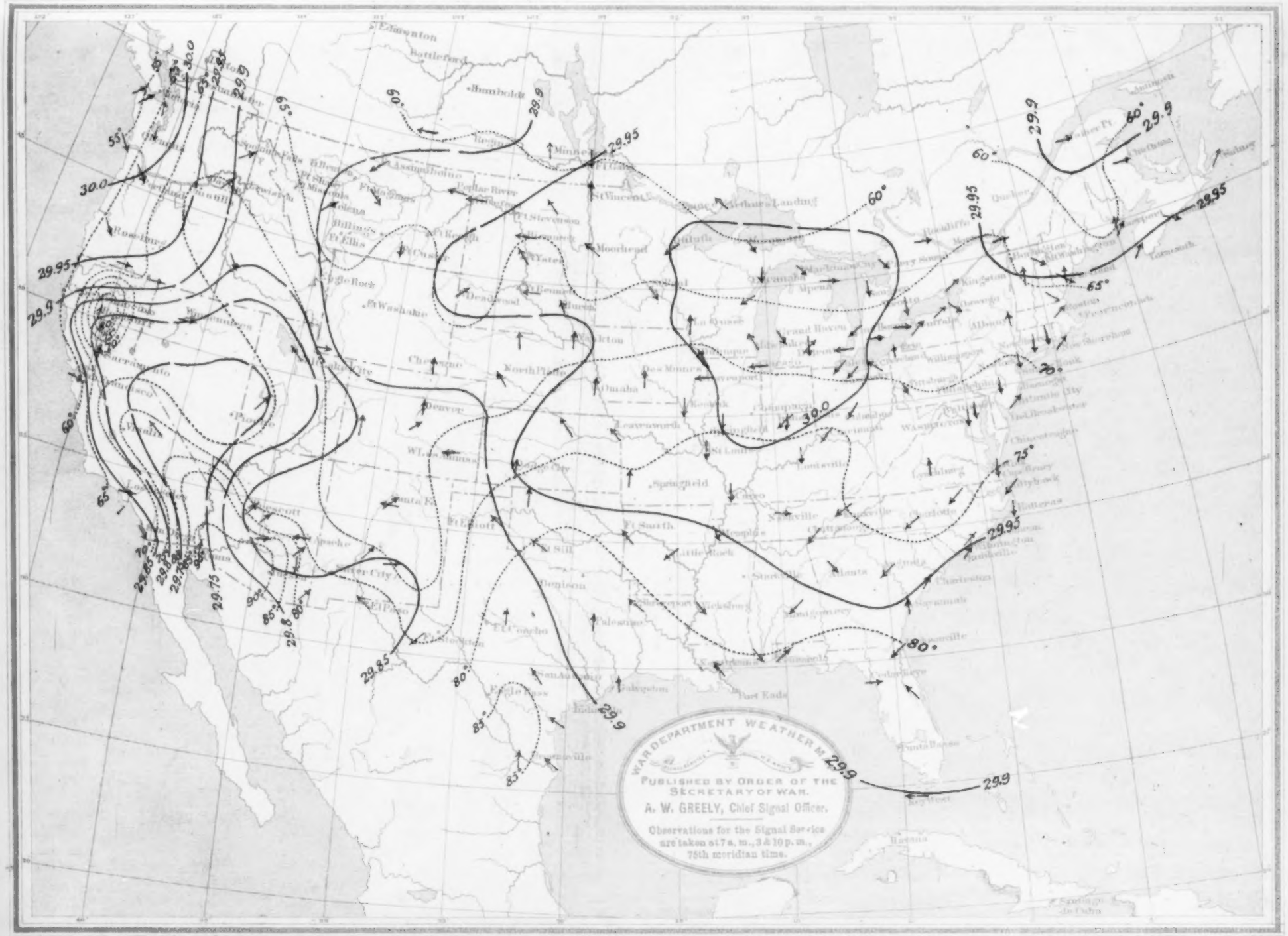


Signal Office Lith.

Chart II. Isobars, Isotherms and Winds. August, 1887.

Form 106 F

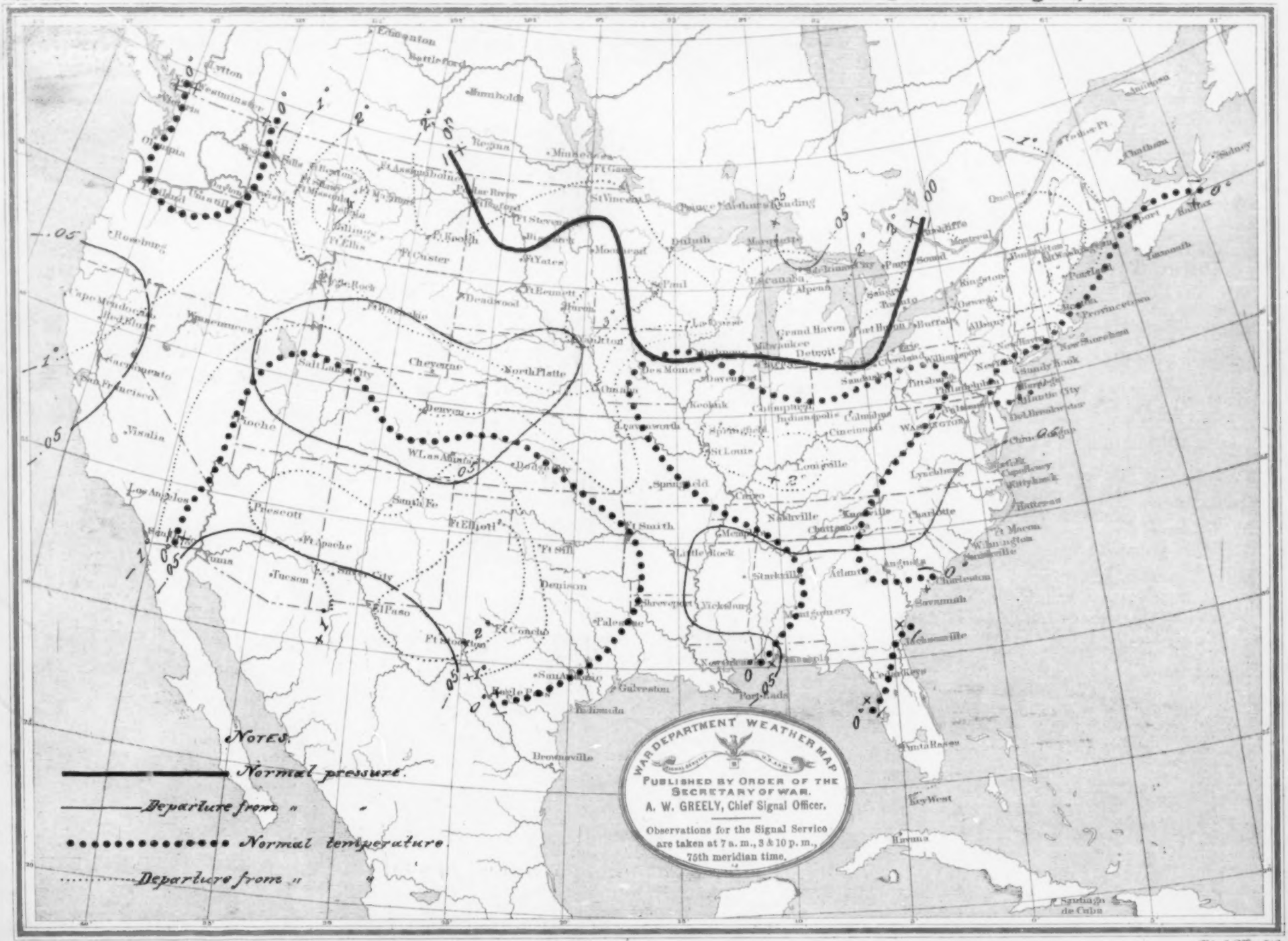
Chart II. Isobars, Isotherms, and Winds. August, 1887.


WAR DEPARTMENT WEATHER MAP
PUBLISHED BY ORDER OF THE SECRETARY OF WAR.
A. W. GREELY, Chief Signal Officer.
Observations for the Signal Service are taken at 7 a. m., 3 & 10 p. m., 75th meridian time.

Signal Office Lith.

Form 106 F

Chart III. Departures from Normal Atmospheric Pressure and Temperature. August, 1887.

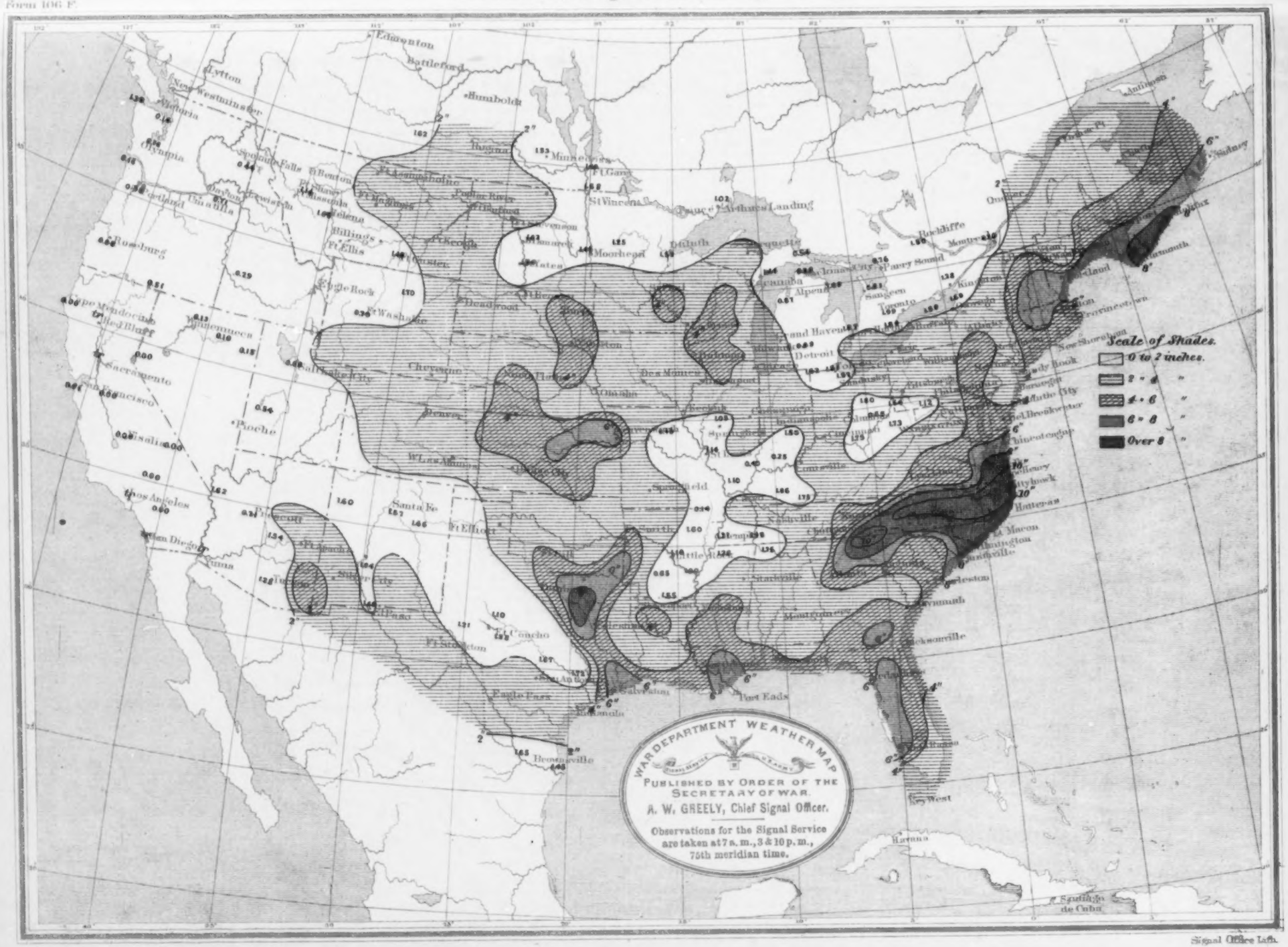

NOTES.
Normal pressure.
Departure from "
Normal temperature.
Departure from "
WAR DEPARTMENT WEATHER MAP
PUBLISHED BY ORDER OF THE SECRETARY OF WAR.
A. W. GREELY, Chief Signal Officer.
Observations for the Signal Service are taken at 7 a. m., 3 & 10 p. m., 75th meridian time.

Signal Office Lith.

Chart IV. Precipitation, August, 1887.

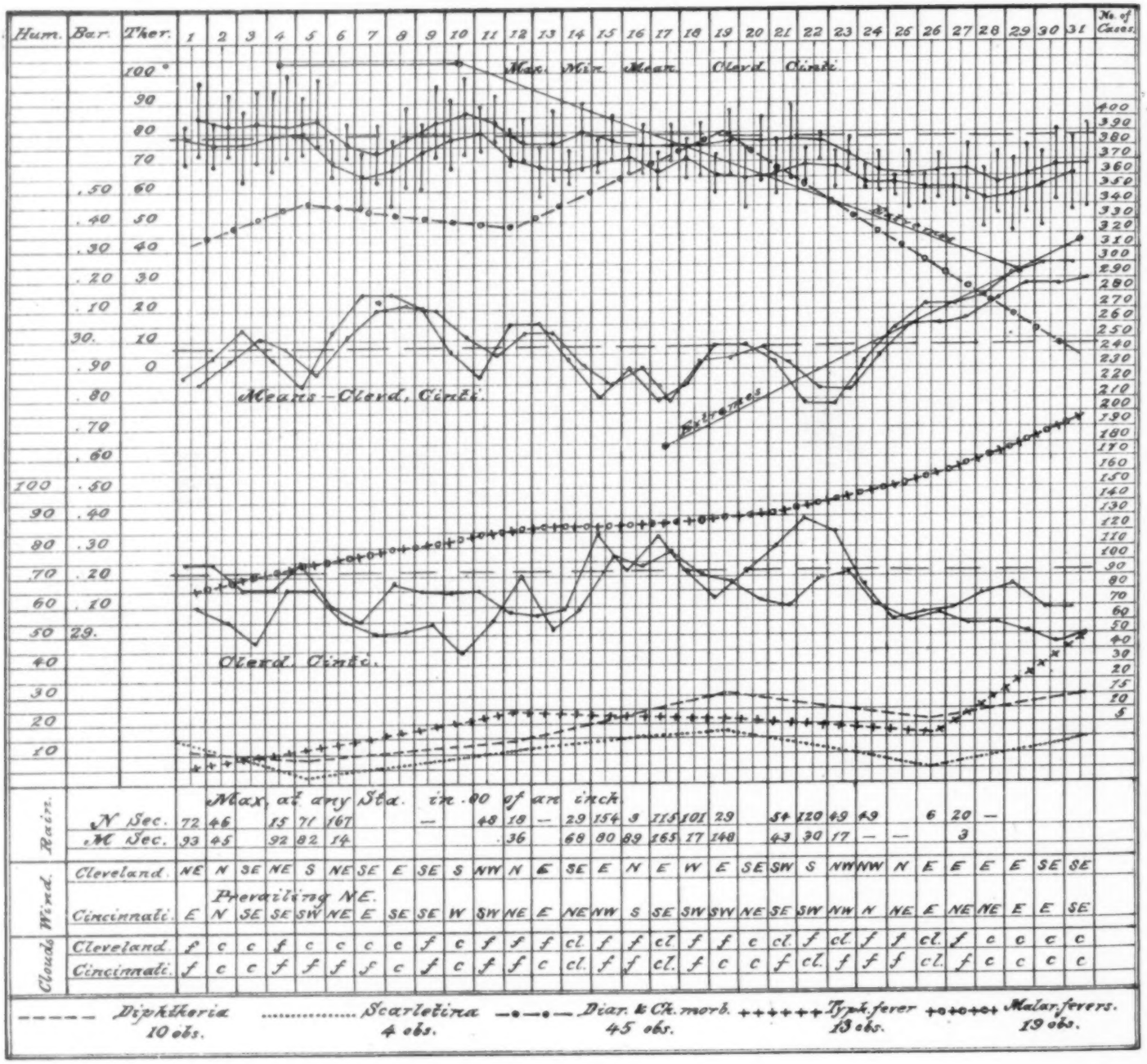
Form 106 F.

Chart IV. Precipitation, August, 1887.


Scale of Shades.
0 to 2 inches.
2 " 4 "
4 " 6 "
6 " 8 "
Over 8 "
WAR DEPARTMENT WEATHER MAP
PUBLISHED BY ORDER OF THE SECRETARY OF WAR.
A. W. GREELY, Chief Signal Officer.
Observations for the Signal Service are taken at 7 a. m., 3 & 10 p. m., 75th meridian time.

Signal Office Lith.

Chart V. Meteorological and Health Chart for Ohio. August, 1887.



Voluntary observers of the Signal Service, on land, from whom meteorological reports were received in time to be used in the preparation of the Monthly Weather Review for August, 1887.

Observer and place of observation.

Alexander, S., Birmingham, Mich.
Acosta, L. P., "Director," Mazatlan, Mex.
Anderson, Dr. W. W., Stateburg, S. C.
Altaffer, J. M., Independence, Kans.
Abbott, Dr. E. K., Salinas, Cal.
Arents, Hiram, Oroville, Cal.
Adams, A. H., Fort Meade, Fla.
Adams, Dr. O. H., Vineland, N. J.
Andrews, Luman, Southington, Conn.
Avey, O. H., Oskaloosa, Iowa.
Beans, Thos. J. Moorestown, N. J.
Bell, Joseph, Franklin, Pa.
Boerner, Prof. Chas. G., Vevay, Ind.
Bently, David, Willows, Cal.
Bayerly, J. F., Spartanburg, S. C.
Ballou, Dr. N. E., Sandwich, Ill.
Bennett, Geo., Bandon, Oregon.
Boies, Lt. A. H., Hudson, Mich.
Baker, Dr. Henry B., Lansing, Mich.
Beall, Dr. R. L., Lenoir, N. C.
Brendel, Dr. Fred., Peoria, Ill.
Bartlett, E. B., Vermillion, N. Y.
Briggs, John, Albany, Oregon.
Betts, Prof. Arthur, Webster, Dak.
Breed, J. E., Embarras, Wis.
Beloit College, Observatory, Beloit, Wis.
Birt, Thomas, Utica, N. Y.
Broberg, Mrs. Mary W., Manatee, Fla.
Black, W. H., Kalamazoo, Mich.
Blachly, C. P., Manhattan, Kans.
Bridges, Q. A., Berlin Mills, N. H.
Bowman, Peter, Ruggles, Ohio.
Boyd, Joseph, Oskaloosa, Iowa.
Cook, S. A., Milledgeville, Ga.
Carrington, G. D., Brownville, Nebr.
Calhoun, P. B., Austin, Tenn.
Carpenter, Dr. W. B., Leavenworth, K.
Charbonnier, Prof. L. H., Athens, Ga.
Chapin, Adams, Poway, Cal.
Casey, Geo., Auburn, N. Y.
Crawford, E. A., Liberty Hill, La.
Cornell University, Ithaca, N. Y.
Collin, Prof. Alonzo, Mount Vernon, Iowa.
Cutting, Dr. Hiram A., Lunenburg, Vt.
Clark, F. A., Weldon, N. C.
Cass, John J., Allison, Kans.
Childs, W. H., Brattleborough, Vt.
Cutler, B. B., Heath, Mass.
Collie, G. L., Delavan, Wis.
Conant Observatory, Dudley, Mass.
Cotton, Dr. D. B., Portsmouth, Ohio.
Cheney, Wm., Minneapolis, Minn.
College of Sacred Heart, Prairie du Chien, Wis.
Carter, Rev. Dr. W. H., Tallahassee, Fla.
Cummings, L. D., Palmyra, N. Y.
Crump, M. H., Bowling Green, Ky.
Crozier, Lafe, Laconia, Ind.
Cochran, Wm. P. Wakefield, Kans.
Colton, Prof. G. H., Hiram, Ohio.
Caulkins, John S., Thornville, Mich.
Cole, Seward, Cahuenga, Cal.
Chandler, Dr. W. J., South Orange, N. J.
Cass, W. Earle, Roseland, N. J.
Curtiss, G. G., Fallston, Md.
Dow, Roswell, Sycamore, Ill.
Dinsmore, Prof. F. H., Emporia, Kans.
Drake, W. T., Marshall, Mich.
Dechant, C. M., Reading, Pa.
Dudley, Chas. B., Altoona, Pa.

Observer and place of observation.

Dunlap, W. L., Tecumseh, Nebr.
Dazey, J. B., Charleston, Ill.
Deming, H. D., Wellsborough, Pa.
Downing, A. L., Concord, N. H.
Davis, McLean W., Indiana, Pa.
Dozier, Wm., Mattoon, Ill.
Dewhurst, Rev. E., Voluntown, Conn.
Day, Theodore, Dyberry, Pa.
Edgington, R. P., Morse, Kans.
Eliason, W. A., Statesville, N. C.
Ellis, John, Marquette, Nebr.
Ewell, Dr. M. D., South Evanston, Ill.
Evans, J. W., Alma, Colo.
Ellsworth, W. W., Hartford, Conn.
Eckstein, Rev. M., Conception, Mo.
Ferris, B. F., Sunman, Ind.
Fouch, Dr. A., Andersonville, Cal.
Friend, Chas. W., Carson City, Nev.
Ferrill, B. P., Duke, Fla.
Frear, Wm., State College, Pa.
Fernald, Prof. M. C., Orono, Me.
Fleming, John, Readington, N. J.
Fuller, Edw. N., Tacoma, Wash.
Featherston, Wm., Globe, Kans.
Field, T. G., Parkersburg, W. Va.
Ford, H. C., El Dorado, Kans.
Fox, F. E., Fall Brook, Cal.
Gibson, J. H., Salina, Kans.
Gates, W. B., Burlington, Vt.
Gray, F. R., Yates Centre, Kans.
Gillingham, Milnor, Fallsington, Pa.
Goodspeed, Chas. W., Elyria, Ohio.
Gowey, H. D., North Lewisburg, Ohio.
Green, Dr. Jesse C., West Chester, Pa.
Gerrish, S. H., Sacramento, Cal.
Goodwin, Rev. William, North Colebrook, Conn.
Gordon, Dr. G. G., Swartz Creek, Mich.
Gibbs, Geo. I., Grand Turk, Turk's Island, British W. Indies.
Garlick, Rev. Dr. J. R., Bruington, Va.
Gray, Capt. A. W., Kenewick, Wash.
Grathwohl, John, Blooming Grove, Pa.
Hamilton, W. H., Corsicana, Tex.
Harvard College Observatory, Cambridge, Mass.
Hammitt, John W., College Hill, Ohio.
Harris, T. C., Raleigh, N. C.
Heaton, Isaac E., Fremont, Nebr.
Hodge, Rev. F. B., Wilkesbarre, Pa.
Hoskinson, R. M., Blakely, Wash.
Hardy, Samuel E., East Norway, Kans.
Hyde, G. A., Cleveland, Ohio.
Hartzler, J. A., Mottville, Mich.
Hole, C. F., Butlerville, Ind.
Held, Rev. F. B., Mount Angel, Oreg.
Heatwole, L. J., Dale Enterprise, Va.
Hatch, A. H., Windsor, Ill.
Harris, W. C., Dover, N. J.
Hunter, Dr. T. C., Napoleon, Ohio.
Hewit, S. F. H., Middlebrook, W. Va.
Helm, Thos. B., Logansport, Ind.
Heacock, J. L., Quakertown, Pa.
Hazen, Rev. A., Deerfield, Mass.
Harper, E. G., Harper's Ferry, Ky.
James, John W., Marengo, Ill.
Jennison, Henry L., Starkey, N. Y.
Jones, Dr. E. U., Taunton, Mass.
Jordan, Dr. M. D. L., Milan, Tenn.
Kirkwood, E., Mauzy, Ind.
Knapp, J. G., Limona, Fla.
Keese, G. Pomeroy, Cooperstown, N. Y.

Observer and place of observation.

Lincoln, A. T., Marion, Va.
Loveland, Wm. Corry, Pa.
Loomis, J. C., Jeffersonville, Ind.
Logan, David, Meadville, Pa.
Luther, S. M., Garrettsville, Ohio.
Lerch & Rice, Bethlehem, Pa.
Lüps, Miss Clasina, Manitowoc, Wis.
Loundes, R. T., Clarksburg, W. Va.
McDonogh Institute, McDonogh, Md.
McClintock, Frank, Grand June'n, Colo.
Meade, Elwood, Fort Collins, Colo.
Marshall, Gregory, Cresco, Iowa.
Massachusetts Agricultural Experimental Station, Amherst, Mass.
McCready, Miss L. A., Ft. Madison, Iowa
McGahan, Dr. C. F., Hot Springs, N. C.
Moore, C. R., Bird's Nest, Va.
Mikesell, Thos., Wauseon, Ohio.
Micklem, J. H., Variety Mills, Va.
Macrae, Colin, Kirkwood, S. C.
Meehan, Thomas, Germantown, Pa.
McDowell, W. R., Highmore, Dak.
Moore, Dr. J. W., Easton, Pa.
Motte, Luke S., West Milton, Ohio.
Moore, Nathan, Grampian Hills, Pa.
Mitchell, Dr. D. W., Harrisville, Mich.
Newcomb, G. S., Westborough, Mass.
Newell, W. C. T., Henry, Dak.
Norco n, Prof. T. J., Reidsville, N. C.
Nordberg, Prof. A., Richardton, Dak.
Neal, Dr. J. C., Archer, Fla.
Osborn, Dr. T. C., Cleburne, Tex.
Olds, H. D., Cedar Rapids, Iowa.
Ogden, Charles, Elkin, Ky.
Owsley, Dr. J. B., Jacksonborough, O.
Pearce, Thomas, Eola, Oregon.
Prouty, Florence, Humboldt, Iowa.
Peele, Capt. Adolphus, New Westminster, B. C.
Palmer, Frank W., Antrim, N. H.
Purdue University, Lafayette, Ind.
Peckham, Prof. W. C., Brooklyn, N. Y.
Pettersén, Dr. F., Comfort, Tex.
Pollock, Edw., Lancaster, Wis.
Postma, H. Y., Egg Harbor City, N. J.
Pendleton, A., Nicolaus, Cal.
Romig, J. K., La Grande, Oregon.
Richmond, S. L., Salem, N. J.
Renfrew, H. N., Bancroft, Iowa.
Rathburn, J. C., Midland, Tex.
Remington, C. V. S., Fall River, Mass.
Robertson, T. D., Rockford, Ill.
Roberts, Luke, Clinton, Iowa.
Runge, C., New Ulm, Tex.
Richardson, C. F., Beverly, N. J.
Rotch, A. L., Blue Hill Observatory, Blue Hill, Mass.
Rodman, Thomas R., New Bedford, Mass
Rice, Chas. W., Yellow Springs, Ohio.
Swezey, Prof. G. D., Crete, Nebr.
Stern, Jacob T., Logan, Iowa.
Smith, H. D., Monticello, Iowa.
Shaw, E., Ninnescah, Kans.
Seltz, Chas., De Soto, Nebr.
Shriver, E. T., Cumberland, Md.
Smith, Prof. T. Berry, Fayette, Mo.
Schleicher, Rob't Lewiston, Idaho.
Shriver, Howard, Wytheville, Va.
Scott, Thos. G., Forsyth, Ga.
Stucky, Dr. C. T., Helvetia, W. Va.
Slade, Elisha, Somerset, Mass.

Observer and place of observation.

Sonedecker, Rev. T. H., Tiffin, Ohio.
Smith, John R., North Truro, Mass.
Snow, Prof. F. H., Lawrence, Kans.
Sim. J. R., Summit, Va.
Scribner, H. F. J., Strafford, Vt.
Strong, S. B., Setauket, N. Y.
Swartz, John J., Parkston, Dak.
Samostz, Oscar, Austin, Tex.
Smith, George F., New Midway, Md.
Standenmayer, Dr. L. R., Lincolnton, N. C
Trembly, Dr. J. B., Oakland, Cal.
Thornton, Prof. N. W., Geneseo, Ill.
Tilford, C. M., Silver Falls, Tex.
Tillinghast, C. B., Albany, N. Y.
Teele, Rev. A. K., Blue Hill, Mass.
Truman, Geo. S., Genoa, Nebr.
Turnbo, Silas C., Pro Tem, Mo.
Tuohy, John, Lewis Creek, Cal.
Terborg, Rev. J. E., Pekin, Ill.
Thompson, R. J., Tiffin, Ohio.
Voegeli, Adolphus, Des Moines, Iowa.
Went, E. C., Frankfort, Ky.
Wade, J. S., Homeland, Fla.
Washburn Observatory, Madison, Wis.
Wild, Rev. E. P., Newport, Vt.
Wickersham, Wm. F., Westtown, Pa.
Williams, Rev. C. F., Ashwood, Tenn.
Wadsworth, Dr. J. L. R., Collinsville, Ill.
West, Silas, Cornish, Me.
Wells, Rev. Charles L., Gardiner, Me.
Wylie, Wm., Mount Forest, Canada.
Wait, S. E., Traverse City, Mich.
Washington Aqueduct. { Receiving Reservoir, D.C; Distributing " "; Great Falls Reservoir, Md; Rock Creek Bridge, D. C.
Woodstock College, Woodstock, Md.
Williams College Observatory, Williamstown, Mass.
Wolfe, John H. Wellington, Kans.
Wülfke, E. F., Independence, Iowa.
Wearmouth, James, University of Virginia, Va.
Winipiseogee Lake Cotton and Woolen Manufacturing Co. { Weir's Bridge, N. H.; Woodstock, N. H.; Wolfeborough, N. H.; Lake Village, N. H.; Bristol, N. H.; Belmont, N. H.; Ashland, N. H.
Willis, O. R., A. M., Ph. D., White Plains, N. Y.
Wood, Joseph, Bar Harbor, Me.
Wigg, Dr. Geo., East Portland, Oregon.
Wright, J. W. A., Greensborough, Ala.
Whitney, Chas. E., Humphrey, N. Y.
Whitney, William A., Skowhegan, Me.
Widman, Rev. C. M., Grand Coteau, La.
Williams, Dr. A. C., Elk Falls, Kans.
Wedge, J. C., Fond du Lac, Wis.
White, Rev. J. H., Georgiana, Fla.
Wilson, W. T., Clayton, N. J.
Wetmore, Edw. L., Tucson, Ariz.
Whitmore, J. E., Gallinas Spring, N. Mex.
Walton, J. P., Muscatine, Iowa.
Waterman, Wm., Hay Springs, Nebr.
Webster, Chas. H., Nashua, N. H.
Yates, T. P., Factoryville, N. Y.
Yetter, Wm. G., Catawissa, Pa.
Young, Geo. R., Penn Yan, N. Y.

Military posts from which meteorological reports were received, through the Surgeon General of the Army, in time to be used in the preparation of the Monthly Weather Review for August, 1887.

Alcatraz Island, Cal.
Angel Island, Cal.
A. Lincoln, Fort, Dak.
Bayard, Fort, N. Mex.
Benicia Barracks, Cal.
Bidwell, Fort, Cal.
Brady, Fort, Mich.
Boisé Barracks, Idaho.
Concho, Fort, Tex.
Columbus, Fort, N. Y. H.
Camp Sheridan, Wyo.
Gaston, Fort, Cal.
Gibson, Fort, Ind. T.
Hays, Fort, Kans.
Hot Springs, Ark.
Klamath, Fort, Oreg.
Keogh, Fort, Mont.
Lewis, Fort, Colo.
Laramie, Fort, Wyo.
Meade, Fort, Dak.
McIntosh, Fort, Tex.
Missoula, Fort, Mont.
Mason, Fort, Cal.
McDermit, Fort, Nev.
McDowell, Fort, Ariz.
Monroe, Fort, Va.
Mojave, Fort, Ariz.
Madison Barracks, N. Y.
McHenry, Fort, Md.
Mount Vernon B'ks, Ala.
McKinney, Fort, Wyo.
Niagara, Fort, N. Y.
Niobrara, Fort, Nebr.
Pembina, Fort, Dak.
Presidio of San F., Cal.
Plattsburg Barracks, N. Y.
Robinson, Fort, Nebr.
Reno, Fort, Ind. T.
Randall, Fort, Dak.
Ringgold, Fort, Tex.
Riley, Fort, Kans.
Snelling, Fort, Minn.
St. Francis Bk's, St. Augustine, Fla.
Sisseton, Fort, Dak.
Shaw, Fort, Mont.
Sherman, Fort, Idaho.
Selden, Fort, Nebr.
Supply, Fort, Ind. T.
Sully, Fort, Dak.
Spokane Fort, Wash.
Sidney, Fort, Nebr.
Totten, Fort, Dak.
Townsend, Ft., Wash.
Union, Fort, N. Mex.
Washakie, Fort, Wyo.
West Point Military Academy, N. Y.
Walla Walla, Ft., Wash.
Wingate, Fort, N. Mex.
Yates, Fort, Dak.

State weather services from which meteorological reports were received in time to be used in the preparation of the Monthly Weather Review for August, 1887.

Arkansas, W. U. Simons, Private, Signal Corps, Little Rock, Ark.
Illinois, Col. Charles F. Mills, director, Springfield, Ill.
Indiana, Prof. H. A. Huston, director, Lafayette, Ind.
Iowa, Dr. Gustavus Hinrichs, Iowa City, Iowa.
Kansas, Prof. J. T. Lovewell, director, Topeka, Kans.
Michigan, N. B. Conger, Sgt., Signal Corps, director, Lansing, Mich.
Minnesota, Prof. W. W. Payne, director, Northfield, Minn.
Mississippi, Prof. R. B. Fulton, director, Oxford, Miss.
Nebraska, Prof. Goodwin D. Swezey, Director, Crete, Nebr.
New England Meteorological Society, Prof. Wm. H. Niles, of Boston, Mass., President; Prof. W. M. Davis, of Cambridge, Mass., Secretary.
New Jersey, Prof. George H. Cook, director, New Brunswick, N. J.
North Carolina, Dr. Herbert Battle, director, Raleigh, N. C.
Ohio, Prof. Benj. F. Thomas, director, Ohio State University, Columbus, Ohio.
Oregon, B. S. Pague, Private, Signal Corps, Roseburg, Oregon.
South Carolina, Hon. A. P. Butler, director, Columbia, S. C.
Tennessee, J. D. Plunket, M. D., director; H. C. Bate, assistant, Nashville, Tenn.

PRICE-LIST OF

STANDARD METEOROLOGICAL INSTRUMENTS, APPARATUS, TEXT-BOOKS, FORMS, AND PUBLICATIONS.

Furnished by Henry J. Green, 771 Broadway, New York City.

BAROMETERS.

Common pattern and finish, vernier reading to 100th inch, in pine box:		
Reading down to 26 inches	$30.00	Packing and shipping by express, $2.50
do. 24 do.	31.00	do. 2.50
do. 20 do.	35.00	do. 2.50
do. 14 do. (two verniers)	53.00	do. 2.50
Common pattern and finish, vernier reading to 1,000th inch, in pine box:		
Reading down to 26 inches	$34.00	Packing and shipping by express, $2.50
do. 24 do.	36.00	do. 2.50
do. 20 do.	40.00	do. 2.50
do. 14 do. (two verniers)	54.00	do. 2.50
Best pattern and finish, vernier reading to 1,000th inch, in pine box:		
Reading down to 26 inches	$36.00	Packing and shipping by express, $2.50
do. 24 do.	38.00	do. 2.50
do. 20 do.	42.00	do. 2.50
do. 14 do. (two verniers)	56.00	do. 2.50
Leather case, in place of pine box	5.00	do. —
Marine barometer	33.00	do. 2.50
Mountain barometer, two verniers, in leather case, to 20,000 feet	63.00	do. 2.50
Mountain barometer, two verniers, in leather case, to 10,000 feet	50.00	do. 2.50
Standard barometer for observatories	75.00	do. 3.25
Barometer tube (glass)	1.25	do. 1.00
Barometer tube, filled and replaced	8.00	do. 2.50
Barometer cistern, complete	4.25	do. .60
Light brass tripod for barometer	10.00	do. .85

THERMOMETERS.

Thermometer for dry or wet-bulb	$ 2.75	Packing and shipping by express, $ .60
do. wet-bulb, support for	.50	do. .25
do. do. cup for	.50	do. .25
do. dry-bulb, support for	.15	do. .25
do. maximum registering	4.50	do. .60
do. minimum do.	3.75	do. .60
do. solar radiation	10.00	do. .75
do. terrestrial radiation	7.00	do. .60
do. small, in metal case, for pocket, engraved stem	2.50	do. .25
do. water	2.60	do. .60
L. R. 11547, P. D., 1882. L. R. 20282, P. D., 1886.		
Anemometer, "Robinson's," (velocity)	$22.50	Packing and shipping by express, $1.10
Electrical recording apparatus, "Gibbon's," (velocity). (L. R. 4315, P. D., 1886.)	24.00	do. 1.10
Anemometer blanks (L. R. 5627, P. D., 1886)		per hundred... 1.00

Furnished by Forsberg & Murray, 1001, 1003, and 1005 Seventh street S. W., Washington, D. C.

Wind vane, sunset	$5 00	Packing, $1 00
do large, with support	20 00	do 2 00
[L. R. 3454 A, P. D., 1887.]		

*Furnished by the Hahl Manufacturing Company, 13 Mercer Street, Baltimore, Maryland.**

Anemograph register (direction and velocity)...	80.00	Packing and shipping by express, $1.50

* L. R. 11503, P. D., 1882.

Furnished by L. H. Rogers, 75 Maiden Lane, New York City.

Signal Service manifold Forms No. 107 F, in books of 100 forms, per book	$1.75
do. 107 G, do.	2.20
do. 107 H, do.	1.00
Indications (Form 109 B), per hundred	.22
L. R. 13397, P. D., 1885.	

Furnished by James J. Chapman, 915 Pennsylvania Avenue, Washington, D. C.

"Loomis'" Meteorology	1.60
L. R. 4021, P. D., 1883.	

Furnished by John Schultzbach, 634 G Street N. W., Washington, D. C.

Rain-gauge, standard 8-inch Signal Service *	$5.00
Rain-gauge, galvanized iron, with overflow and measuring-stick	2.50
Rain-gauge, copper, with galvanized iron overflow and measuring-stick	1.50
Measuring-sticks, extra	.25
Farmers' weather case	$4.75
Case for water thermometer	7.50
L. R. 4051, P. D., 1883. * L. R. 11275, P. D., 1885.	

Furnished by Crane & Co., McWhorter and Oliver Streets, Newark, New Jersey.

Rain-gauge, standard 8-inch, Signal Service	5.00
Whirling apparatus (L. R. 7965, P. D., 1886)	5.00

Furnished by Property and Disbursing Officer, Signal Service, U. S. A., Washington, D. C.

Maps in one color without reports or isobaric lines, each	.013
Maps in one color, without reports or isobaric lines (as used on cyclostyle at Signal Service stations), each	.015
Maps on manifold paper without reports or lines, in books of 100, per book	2.75
Maps in one color with current reports, isobars, and isotherms, each	.02
Monthly Weather Review	.10
Copies of Daily Bulletin, with Synopsis, Indications, and Facts, with maps, stitched in monthly volumes, each (L. R. 10288, P. D., 1881)	2.25
International Daily Bulletin, per copy, each, including the Monthly Summary when daily is subscribed for for the entire month	.11

FLAGS.

Flags for the display of Weather and Temperature signals may be obtained from—

M. G. Copeland & Co., No. 409 Eleventh Street, N. W., Washington, D. C.;
Crane & Co., McWhorter and Oliver Streets Newark, New Jersey;
C. S. Decker, No. 168 State Street, Boston, Massachusetts;
Horstmann Bros. & Co., Fifth and Cherry Streets, Philadelphia, Pennsylvania;
John F. McHugh, No. 1286 Broadway, New York City.

Correspondence in relation to these flags should be had direct with the above firms and not through this office.

Any of the above-enumerated instruments, apparatus, etc., may be obtained at the prices named, with such *additional cost* of packing and shipping as is shown opposite the items respectively. The charges for expressage will be the actual charges of express companies.

Entered at the Post Office, Washington, D. C., as Second-Class Matter.

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PRICE-LIST OF

STANDARD METEOROLOGICAL INSTRUMENTS, APPARATUS, TEXT-BOOKS, FORMS, AND PUBLICATIONS.

Furnished by Henry J. Green, 771 Broadway, New York City.

BAROMETERS.

Common pattern and finish, vernier reading to 100th inch, in pine box:			
Reading down to 28 inches	$30.00	Packing and shipping by express,	$2.50
do. 24 do.	31.00	do.	2.50
do. 20 do.	33.00	do.	2.50
do. 14 do. (two verniers)	35.00	do.	2.50
Common pattern and finish, vernier reading to 1,000th inch, in pine box:			
Reading down to 28 inches	$34.00	Packing and shipping by express,	$2.50
do. 24 do.	36.00	do.	2.50
do. 20 do.	40.00	do.	2.50
do. 14 do. (two verniers)	54.00	do.	2.50
Best pattern and finish, vernier reading to 1,000th inch, in pine box:			
Reading down to 28 inches	$36.00	Packing and shipping by express,	$2.50
do. 24 do.	38.00	do.	2.50
do. 20 do.	42.00	do.	2.50
do. 14 do. (two verniers)	56.00	do.	2.50
Leather case, in place of pine box	8.00	do.	——
Marine barometer	38.00	do.	2.50
Mountain barometer, two verniers, in leather case, to 21,000 feet	63.00	do.	2.50
Mountain barometer, two verniers, in leather case, to 10,000 feet	30.00	do.	2.50
Standard barometer for observatories	75.00	do.	3.25
Barometer tube (glass)	1.25	do.	1.00
Barometer tube, filled and replaced	6.00	do.	2.50
Barometer cistern, complete	4.25	do.	.60
Light brass tripod for barometer	10.00	do.	.85

THERMOMETERS.

Thermometer for dry or wet-bulb	$ 2.75	Packing and shipping by express,	$ .60
do. wet-bulb, support for	.50	do.	.25
do. do. cup for	.50	do.	.25
do. dry-bulb, support for	.15	do.	.25
do. maximum registering	4.00	do.	.60
do. minimum do.	3.75	do.	.60
do. solar radiation	10.00	do.	.75
do. terrestrial radiation	7.00	do.	.60
do. small, in metal case, for pocket, engraved stem	2.50	do.	.25
do. water	3.00	do.	.60

L. R. 11547, P. D., 1862. L. R. 20282, P. D., 1866.

Anemometer, "Robinson's," (velocity)	$22.50	Packing and shipping by express,	$1.10
Electrical recording apparatus, "Gibbon's," (velocity). (L. R. 4315, P. D., 1866.)	26.00	do.	1.10
Anemometer blanks (L. R. 5627, P. D., 1866)		per hundred...	1.00

Furnished by Forsberg & Murray, 1001, 1003, and 1005 Seventh street S. W., Washington, D. C.

Wind vane, sunset	$5 00	Packing,	$1 00
do large, with support	20 00	do	2 00

[L. R. 3464 A, P. D., 1867.]

Furnished by the Hahl Manufacturing Company, 13 Mercer Street, Baltimore, Maryland.

Anemograph register (direction and velocity)...	$0.00	Packing and shipping by express,	$1.20

L. R. 11363, P. D., 1862.

Furnished by L. H. Rogers, 75 Maiden Lane, New York City.

Signal Service manifold Forms No. 107 F, in books of 100 forms, per book			$1.75
do. 107 G,	do.		2.50
do. 107 H,	do.		1.00
Indications (Form 109 B), per hundred			.25

L. R. 13397, P. D., 1865.

Furnished by James J. Chapman, 915 Pennsylvania Avenue, Washington, D. C.

"Loomis' " Meteorology	1.00

L. R. 4021, P. D., 1863.

Furnished by John Schultebach, 634 G Street N. W., Washington, D. C.

Rain-gauge, standard 8-inch Signal Service	$5.00
Rain-gauge, galvanized iron, with overflow and measuring-stick	2.50
Rain-gauge, copper, with galvanized iron overflow and measuring-stick	1.50
Measuring-sticks, extra	.25
Farmers' weather case	54.70
Case for water thermometer	7.50

L. R. 4061, P. D., 1863. L. R. 11275, P. D., 1865.

Furnished by Crane & Co., McWhorter and Oliver Streets, Newark, New Jersey.

Rain-gauge, standard 8-inch, Signal Service	5.00
Whirling apparatus (L. R. 7965, P. D., 1866)	5.00

Furnished by Property and Disbursing Officer, Signal Service, U. S. A., Washington, D. C.

Maps in one color without reports or isobaric lines, each	.015
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